Registered as a Newspaper

Technology

GAS JOURNAL

LIGHT · HEAT · POWER · BY-PRODUCTS

Vol. 201. 85th Year. | LONDON, MARCH 15, 1933. | No. 3643. Price 1s.

OXIDE OF IRON
SPENT OXIDE
Gas Purification & Chemical Co.
— LTD. —
PALMERSTON HOUSE, LONDON, E.C. 2

WILTON'S
AMMONIA PLANTS WITHOUT SULPHURIC ACID
WITH AUTOMATIC CONTROL
CHLORIDE
BICARBONATE
B.P. CARBONATE
ANHYDROUS
25% PURE
CRUDE CONCENTRATED
COMBINED SULPHATE SULPHURIC ACID PLANT
The Chemical Engineering & Wilton's Patent Furnace Co. LTD.
76, Victoria Street, London, S.W. 1

"LUX"
Purifying Material from STOCK.
THOS. DUXBURY & CO.,
16, Deansgate, Manchester.
Palace Chambers, Westminster, S.W. 1

Broadhead Constructions Limited

Thomas Glover
& Co., Ltd.,
METERS
See Advert. on p. 668.

SIMPLEX
WATER GAS PLANT
& ORDINARY HORIZONTALS PRODUCE
90 THERMS PER TON
WITHOUT INCREASED LABOUR COSTS OR AUXILIARY PLANT
Vertical Gas Retort Syndicate, LTD.
17, VICTORIA STREET, WESTMINSTER, S.W.1

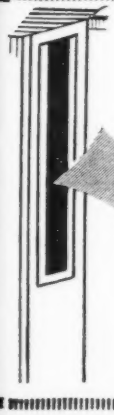
M & M "NEW M" PATENT
RUSTLESS SELF-LOCKING METER
LOCKS.

Be sure you get the genuine article. Look for the Patent NUMBER
CHEAPEST IN THE LONG RUN
H. MITCHELL & CO., 3 & 5, LEICHTON ROAD, N.W.5

NATURAL STEEL GREY
FERRODOR
PAINT
FOR GAS HOLDERS
Made with "Ferrodor" Ore — an indestructible, flaky pigment which interleaves and forms a perfect protective coating against corrosion.
Griffiths Bros. & Co. London Ltd.
Bermondsey, London, S.E. 16

JAMES McKELVIE & CO.
Coal Owners,
Gas and Steam Coal Contractors,
17, RUTLAND SQUARE, EDINBURGH, 1.
Astor House, Aldwych, London, W.C.2.
Guildhall Chambers, Sandhill, Newcastle-on-Tyne, 1.
24, Chapel Street, Liverpool.
ESTABLISHED 1840.

W. PARKINSON & CO.
Incorporated in Parkinson & Cowan (Gas Meters) Ltd.
LONDON AND BIRMINGHAM.
(See Advertisement on p. 668.)


Pennies & Shillings
George Glover's
"CHELSEA TWO"
COIN METER.
Gives the consumer the choice of using two coins, pennies and shillings, without altering the Meter in any way. Made in Standard and High Capacity sizes.
GEORGE GLOVER & CO., LTD.
Dry Meter Manufacturers and Repairers
RANELAGH WORKS, ROYAL AVENUE, CHELSEA, LONDON, S.W.3.
Phone: Sloane 7257—7258. Wires: "Dry Meters, 'Phone, London."
BRANCHES: LEEDS AND MANCHESTER.

UNSURPASSED FOR
ACCURACY
DURABILITY &
RELIABILITY

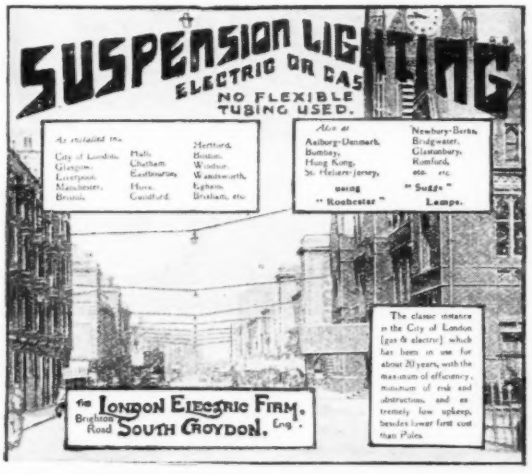
J. & J. BRADDOCK
BRANCH OF METERS LTD.

MANUFACTURERS OF
DRY GAS METERS
OF THE BEST CONSTRUCTION & QUALITY
"HIGH CAPACITY" "STANDARD"
& "LIGHTS TYPE"
BEST VALUE OBTAINABLE

GLOBE METER WORKS,
OLDHAM.
AND
45-47 WESTMINSTER BRIDGE RD.
LONDON S.E.1.

Telegrams:
"Braddock, Oldham."
"Metrique, Lamb, London."

Telephones:
Main (Oldham) 3815 6.
2412 Hop London.



MORE WORKING HOURS
LESS REPAIR COSTS

Glenboig Bricks and Retorts appreciably *increase* the number of productive hours per year, and appreciably *decrease* the number of repairs. Exclusive clay and a century's experience in efficient milling, modelling, firing and finishing are the reasons.

Particulars and quotations for specified requirements on request.

Sole Proprietors and Manufacturers:
THE GLENBOIG UNION FIRECLAY CO., LTD.
Head Office: 48, West Regent Street, GLASGOW, C.2.
Telephones:
Douglas 5009 and 2120.

GLENBOIG BRICKS

GAS EXHAUSTING PLANT

Also Makers of

Valves of all types and sizes.

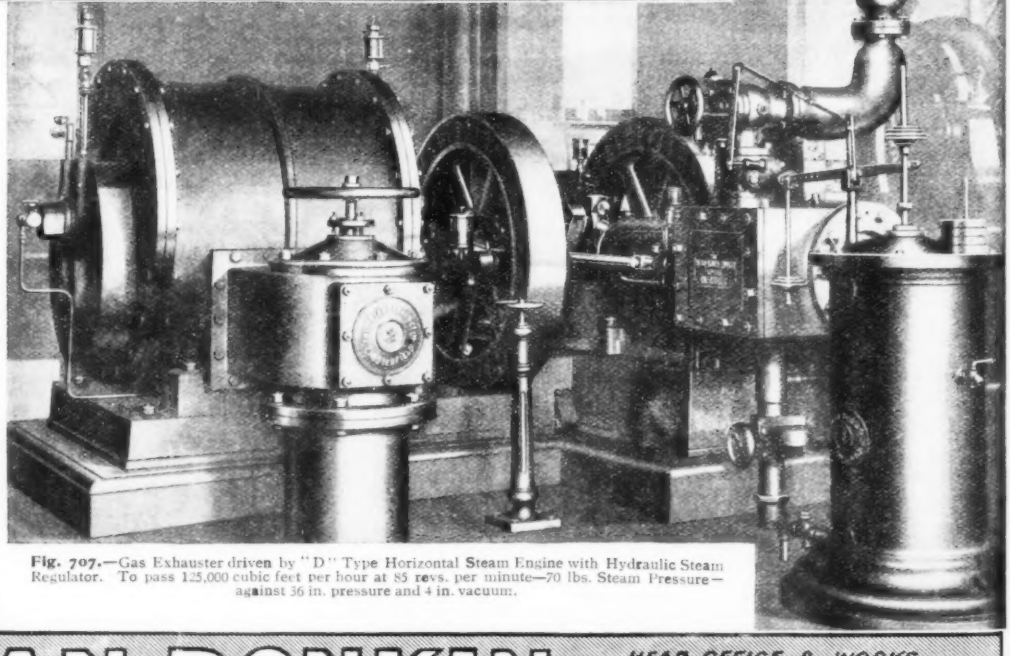


Fig. 707.—Gas Exhauster driven by "D" Type Horizontal Steam Engine with Hydraulic Steam Regulator. To pass 125,000 cubic feet per hour at 85 revs. per minute—70 lbs. Steam Pressure—against 36 in. pressure and 4 in. vacuum.

The BRYAN DONKIN CO. LTD.

HEAD OFFICE & WORKS:
CHESTERFIELD.

CONTENTS

EDITORIAL NOTES.

A GLANCE AT THE CONTENTS . . . 669
"This is an Art that Does Mend Nature" . 670
A Pioneer Effort 670
Progress at Stafford 670
Happy Embarrassment 671
Taxation Cases in the Courts 671

CORRESPONDENCE.

Why Not a Women's Gas Association? . . 672

Forthcoming Engagements 669
Personal 672
Obituary 672

NEWS OF THE WEEK.

Paragraphs 672–673
Gas Progress in Liverpool 673
Symposium on Coal Utilization 673
Cheltenham and District Gas Company . . 673
Brighouse Gas Charges 674
Petrol from British Coal—Order for Supplies for Air Ministry 674
Municipal Economy (?) 674
Display Exhibition Planned for Olympia . 674
Electrical Idea of Ratepayer's Choice! . . 674

NEWS OF THE WEEK—(*continued*).

A Prize-Winning Photograph 675
Danish Contract Goes to Manchester . . . 675
European Gas Company, Ltd. 675
Stanton Ironworks Company—Comprehensive Operations 675
Gas Furnaces 676
B.O.T. Return Relating to Gas Undertakings 676
Deal Sports Club Dinner 676

SPECIAL ARTICLES, &c.

Book Review 673
London and Southern District Junior Gas Association—
Visit to the Staveley Coal and Iron Company's Works, near Chesterfield . . . 677
Gas and Gas Coke for Hot Water Supply. By the B.C.G.A. 679
Heating in the Future 684
School Heating by Electricity—Charge of 15s. per Head 684
Gas at the South London Exhibition . . . 685
Notes on Plant and Processes 695

"JOURNAL" TECHNICAL RECORD.

Midland Association of Gas Engineers and Managers—
Business Meeting 687
Presidential Address of Mr. T. H. Poulson 688

"JOURNAL" TECHNICAL RECORD—(*continued*).

Oil from Coal 691
Manchester District Association of Gas Engineers—
General Business 692
Presidential Address of Mr. G. Dixon . . 692
Midland Junior Gas Association—
Visit to the Windsor Street Gas-Works of the Birmingham Gas Department . . 694

MISCELLANEOUS.

Parliamentary Intelligence—
South Suburban Gas Bill 696
Gas Companies' Results in 1932 699
Corporation Undertakings' Results in 1932 . 701
Watford and St. Albans Gas Company . . 702

GAS MARKETS AND MANUFACTURES.

Stock Market Report 702
Current Sales of Gas Products 702
Trade Notes 702
Contracts Advertised To-Day 702

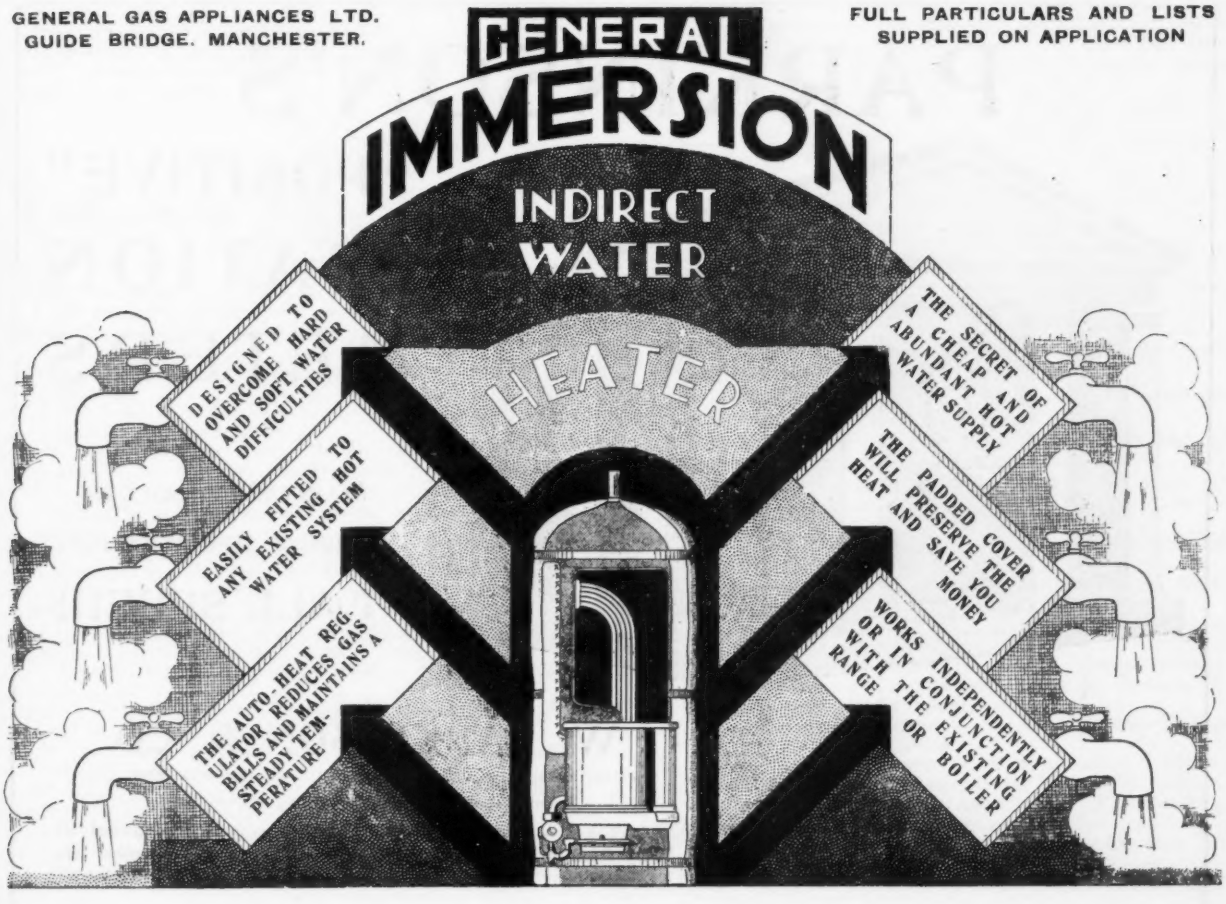
Stock and Share List 703

"JOURNAL" Telephone: Central 2236-7 (2 lines)

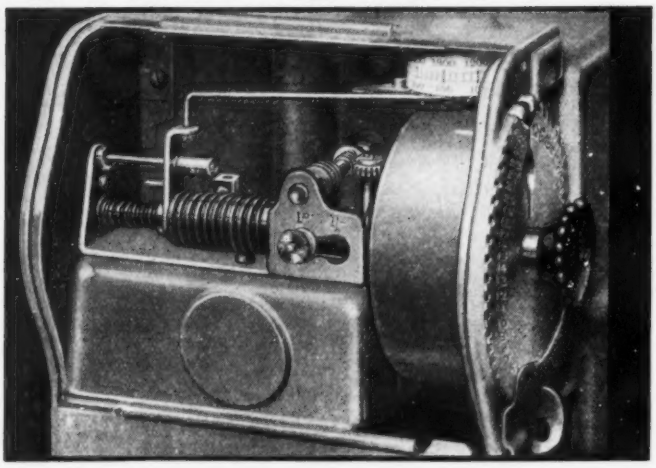
For Advertisers' Index—see p. 708

GENERAL GAS APPLIANCES LTD.
GUIDE BRIDGE. MANCHESTER.

FULL PARTICULARS AND LISTS SUPPLIED ON APPLICATION


GENERAL
IMMERSION
INDIRECT
WATER
HEATER
DESIGNED TO OVERCOME HARD AND SOFT WATER DIFFICULTIES
EASILY FITTED TO ANY EXISTING HOT WATER SYSTEM
THE AUTO-HEAT REGULATOR REDUCES GAS BILLS AND MAINTAINS A STEADY TEMPERATURE
THE SECRET OF A CHEAP AND ABUNDANT HOT WATER SUPPLY
THE PADDED COVER WILL PRESERVE THE HEAT AND SAVE YOU MONEY
WORKS INDEPENDENTLY OR IN CONJUNCTION WITH THE EXISTING RANGE OR BOILER

SIMPLICITY



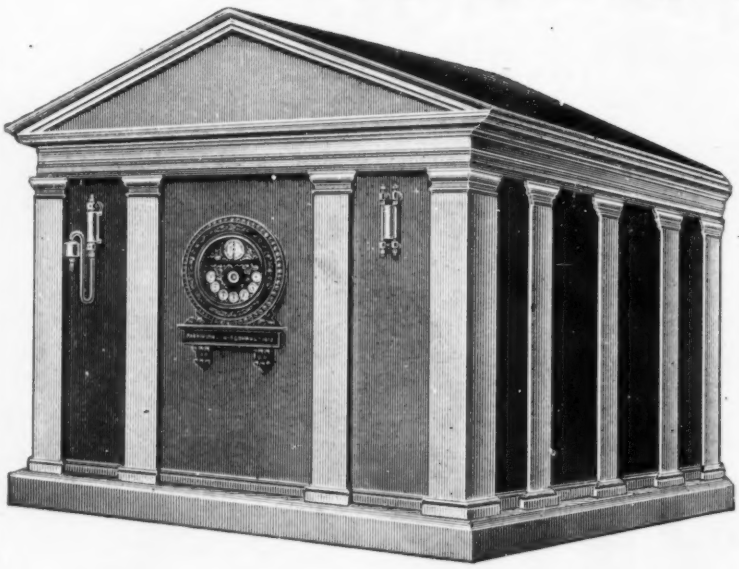
ALL UNNECESSARY PARTS ARE ELIMINATED IN THE THOMAS GLOVER PREPAYMENT MECHANISM ASSURING TROUBLE-FREE SERVICE

THOMAS GLOVER & CO., LTD.

ORIGINAL DRY GAS METER MAKERS ESTABLISHED 1844

GOTHIC WORKS : EDMONTON : LONDON N 18 : & BRANCHES

PARKINSON'S



"POSITIVE" STATION METERS

MAINTAIN ABSOLUTE CORRECT REGISTRATION AT ALL SPEEDS

W. PARKINSON & CO.

INCORPORATED IN PARKINSON & COWAN (GAS METERS) LTD.

TERMINAL HOUSE, GROSVENOR GARDENS, LONDON, S.W.1.

Cottage Lane, City Road, LONDON.

Iron Lane, Stechford, BIRMINGHAM.

Raphael St., Cromac St., BELFAST.

THE GAS JOURNAL

MARCH 15, 1933

Vol. 201. 85th Year No. 3643

A Glance at the Contents—

Engineer and Manager Required.

A Lancashire Corporation is advertising for a Gas Engineer and Manager, the commencing salary being £675 per annum. [p. 705.]

Midland Association.

The annual general meeting of the Midland Association of Gas Engineers and Managers was held last week, when Mr. T. H. Poulson, of Stafford, delivered his Presidential Address. [p. 687.]

Gas and Coke for Hot Water Supply.

How to extend the use of gas and coke for hot water supply was the subject of a paper presented by the B.C.G.A. at the Joint Gas Conference in Birmingham, when an important discussion on different phases of the problem took place. [p. 679.]

A Visit to the Staveley Coal and Iron Company.

An interesting visit was made by the London and Southern District Junior Gas Association last Wednesday to the Works of the Staveley Coal and Iron Company, Ltd., near Chesterfield, where the manufacture of sand-spun pipes was witnessed. [p. 677.]

South Suburban Gas Bill.

A House of Lords Committee has considered this Bill, which seeks to enable the South Suburban Gas Company to charge differential prices in different parts of its limits of supply, varying from ¼d. to 2¾d. per therm above the price charged in the more populous Metropolitan or inner area. [p. 696.]

Manchester District Association.

In his Address as President of the Manchester District Association of Gas Engineers, Mr. G. Dixon, of Nottingham, mentioned the success which has attended efforts in Nottingham to prepare and market satisfactory cokes. Such is the demand, in fact, that the present position is "almost embarrassing." Orders have to be refused daily. [p. 692.]

Gas Charges at Brighouse.

Mr. C. R. Ingham, Engineer and Manager to the Brighouse Corporation Gas Department, is introducing an interesting system of gas pricing designed to suit particular classes of consumers. The idea is to reward the remunerative consumer by supplying him with gas at a low cost after a certain obligation has been met. The enterprise should be a great success. [p. 674.]

Forthcoming Engagements

March 16.—SOCIETY OF BRITISH GAS INDUSTRIES.—Meeting, 12 noon, 56, Victoria Street, S.W. 1.

March 16.—SOUTHERN ASSOCIATION (WESTERN DISTRICT).—Meeting at Exeter.

March 17.—LONDON AND SOUTHERN JUNIOR ASSOCIATION.—Meeting. Paper by Mr. C. M. Wearing.

March 21.—I.G.E.—Meeting of Gas Appliances Sub-Committee, 2.30 p.m.

March 22.—SOUTHERN ASSOCIATION (EASTERN DISTRICT).—Meeting at 28, Grosvenor Gardens, S.W. 1, 2.30 p.m.

March 22.—YORKSHIRE JUNIOR ASSOCIATION.—Joint meeting at York with the MANCHESTER AND DISTRICT JUNIOR ASSOCIATION.

March 25.—SCOTTISH JUNIOR ASSOCIATION (WESTERN DISTRICT).—Annual Business Meeting, Glasgow. Diploma Thesis by Mr. A. Tran.

March 31.—SOUTHERN ASSOCIATION OF GAS ENGINEERS.—General Meeting at the Hotel Metropole.

April 1.—SCOTTISH JUNIOR ASSOCIATION (EASTERN DISTRICT).—Visit to Kelty Gas-Works. Address by Mr. J. Storrier.

April 6.—MIDLAND JUNIOR ASSOCIATION.—Meeting. Paper by Mr. W. T. Hobson.

April 7.—NORTH BRITISH ASSOCIATION OF GAS MANAGERS.—Spring Meeting in Glasgow.

April 7.—Annual Meeting of Gas Salesmen in London.

April 10.—I.G.E.—Finance Sub-Committee, 2 p.m.; Finance Committee, 2.30 p.m.; Executive Committee of the Council, 3 p.m.; Benevolent Fund Committee of Management, 4.30 p.m.

April 11.—I.G.E.—Council, 10 a.m.; Gas Education Committee, 4 p.m.

April 12.—I.G.E.—General Research Committee, 2.30 p.m.

April 12.—INSTITUTE OF FUEL.—Visit to Beckton Coke Ovens and Greenwich "Metro-Coalite" plants.

April 19.—B.C.G.A.—Meeting of Executive Committee, 12 noon, 28, Grosvenor Gardens, S.W. 1.

April 22.—YORKSHIRE JUNIOR ASSOCIATION.—Meeting at Sheffield. Paper by Mr. H. Wadsworth.

April 29.—WESTERN JUNIOR ASSOCIATION.—Meeting at Bristol. Presidential Address and Annual General Meeting.

May 4.—MIDLAND JUNIOR ASSOCIATION.—Annual General Meeting and Address by Mr. W. B. M'Lusky.

May 5.—NORTH OF ENGLAND ASSOCIATION.—Annual Meeting, County Hotel, Newcastle, at 2 o'clock.

May 5.—LONDON AND SOUTHERN JUNIOR ASSOCIATION.—Annual Business Meeting.

May 6.—MANCHESTER DISTRICT JUNIOR ASSOCIATION.—Visit to Runcorn Gas-Works. Paper by Messrs. H. Goodier and W. E. Saunders.

May 11-12.—EASTERN COUNTIES ASSOCIATION.—Spring General Meeting at Croydon.

May 11.—SOCIETY OF BRITISH GAS INDUSTRIES.—Annual General Meeting and Dinner, Hotel Metropole, London.

May 13.—SCOTTISH JUNIOR GAS ASSOCIATION (EASTERN DISTRICT).—Annual General Meeting at Edinburgh.

May 20.—YORKSHIRE JUNIOR ASSOCIATION.—Meeting at Leeds. Paper by Mr. W. E. Benton.

EDITORIAL NOTES

"This is an Art that Does Mend Nature"

WITH a title-page adorned by a wood block having beneath it the Shakespearian quotation reproduced here, William Matthews published just a century ago the second edition of his "Historical Sketch of the Origin and Progress of Gas Lighting." So long as one hundred years ago, gas lighting possessed a history! Matthews, who spent his younger years in Birmingham or its vicinity, witnessed, in 1802, Murdoch's exhibition of gas lighting at the Soho establishment of Boulton & Watt. Three years later Matthews removed to London, just at the time when Winsor was urging his claims upon the attention of the public, and, as a matter of fact, one of his intimate friends was a subscriber to Winsor's Patent Gas Light and Coke Scheme.

Winsor's promises to subscribers proved unduly optimistic, and, relating their disillusionment, the author was induced to remark: "How often has the love of gain induced men to give a willing ear to the flattering and delusive tales of projectors! Perhaps, however, it is well for the world that self-interest sometimes disposes men to pursue and cherish these hopeful illusions, till time and experience disabuse them of their mistakes; for though individuals may occasionally suffer, the public is often greatly benefited." This is a philosophical manner in which to regard the misfortunes of one's friends, but it is true that the early days of great inventions are usually troublous, and in this case, even a century later, we continue to reap benefit from these disappointed hopes. It is stated that Winsor raised nearly £50,000 by subscriptions for establishing his New Light and Heat Company, the whole of which was expended on his projects. "He was constantly soliciting the public, by advertisements and pamphlets, to attend to, and patronize, his plans, and events have proved that his exertions were not ineffective. . . . By perseverance the persons who had engaged in this great speculation succeeded in the attainment of the leading point which they had so anxiously sought, and Winsor's plan of a National Light and Heat Company was in part accomplished by the legal formation of a *local* Gaslight and Coke Company."

A Pioneer Effort

IT is four years since the Brighouse Gas Department introduced an optional multi-part tariff for consumers of gas used for industrial and trade purposes, and this departure from the practice of the time led to excellent results. Now the Committee, on the advice of their Engineer and Manager, Mr. C. R. Ingham, have gone a step further, and after the next meter reading at the end of the March quarter the whole of the gas supplied will be offered at rates specially designed for the various classes of consumer. The various scales of charges cover domestic users (ordinary and prepayment), industrial and commercial, power, and central heating; and the non-domestic consumer has a choice of systems of charge. The whole scheme appeals to us strongly, and it will, we think, prove a pioneering effort which will be followed by others; it certainly deserves close attention.

The aim of the scheme is towards equity and the extended use of gas for large-scale purposes. The remunerative consumer is to be rewarded, while the non-paying user will be asked to bear a fair burden of the cost of supplying him with gas. Starting next quarter, domestic consumers will be charged at the rate of 10·8d. per therm for the first 5 therms per quarter, 7·2d. per therm for the next 10 therms, and 4·05d. for the next 15 therms; and corresponding rates apply to prepayment consumers. The latter class of consumer is offered an alternative rate of 9s. per quarter as a fixed charge and gas at 4d. a therm. The principle of the rates is quite right in that it gives a substantial reduction after a relatively expensive minimum charge. The scale, too, has the advantage of simplicity though it takes no account of rate of demand.

The Brighouse Town Council did the right thing in adopting the recommendations of the Gas Committee, though admittedly the resolution did not go through without opposition. The main argument raised against it was that the new scale of charges attacked the poor consumer, who, with prevailing industrial conditions, was hard enough hit already. This argument, however, is not wholly justified by facts. The small consumers of gas are by no means necessarily the poor. People with other sources of energy as well as ample financial resources at their command form the majority of those who will be asked to pay more. Fundamentally, of course, the scheme is sound. The primary aim of a gas undertaking is to give the greatest possible service to largest number of consumers; and the new rates which will be put into force next month will, we think, so influence sales and bring about fair dealing that eventually all consumers of gas in the Brighouse area will benefit.

As we have said, the Brighouse scheme appeals to us. It is a determined attempt to cater for modern competitive conditions, and we believe that it will meet with success.

Progress at Stafford

AT their meeting last week the Midland Association had an account of good, steady work accomplished by the Stafford Gas Department during recent years, this account forming the major part of the Presidential Address of Mr. T. H. Poulson. To-day the Department has an efficient modern works and an efficient up-to-date policy; the working results set out by the President speak for themselves. The carbonizing plant is an installation of Glover-West continuous vertical retorts erected fourteen years ago and reconstructed later to increase the capacity from 1,200,000 to 2,000,000 c.ft. per day; and what Mr. Poulson has to say about this reconstruction is indicative of the rapid progress which has marked—and continues to characterize—continuous vertical retorting. Also, his observations on the coal-handling plant show what extraordinarily good workmanship and materials are supplied by our contracting firms. The 25 ton per hour gravity-bucket elevator conveyor has run continuously every day for the past fourteen years, handling without breakdown 250,000 tons of coal. Mr. Poulson rightly observes that "it is a tribute to the excellence of British materials and craftsmanship that the period of usefulness of this conveyor has extended so long. The amount spent on repairs has been negligible, in spite of the fact that the major portion is always exposed to the weather."

The address covers a wide range of practice, and Mr. Poulson's explanation of how the obstacles imposed by a difficult site were overcome, and his description of his trichlorethylene de-greasing plant for cooker reconditioning are full of interest. The latter plant has the advantages of saving in floor space, rapidity in cleaning, and good working conditions. What appeals to us most about the address, however, is the President's policy in

regard to coke sales and his attitude towards the lighting load. No gas-works to-day should be without a coke screening plant; and we agree with Mr. Poulson's statement that if the directing minds of smaller works realized the advantages of a good coke-grading and handling plant they would have no hesitation in installing such plant. As a possible reason why some of the smaller undertakings have not yet installed coke-screening plant, the President remarks that few advertisements of suitable plant appear in the Technical Press. "Generally," he says, "the advertisements illustrate plant suitable only for large works." This is a point which should not be lost sight of by manufacturers.

Stafford installed coke grading and handling plant thirteen years ago, and as a result have saved a matter of £13,000; but, what is still more to the point, they have during this period, through efficient supply of good coke of the correct grade developed goodwill and built up an excellent market. Next to gas, coke brings in our largest revenue, and it would certainly pay our Industry—apart from being prepared to offer good, graded coke—to study more closely the needs of consumers. More attention must be given to better delivery at convenient times and in a manner suited to individual requirements, and to after-service which will ensure that the fuel supplied is being used to the best advantage. As to the lighting load, Mr. Poulson rightly has faith in the merits of gas, and he puts forward suggestions for improving existing lighting equipment.

A section of the address is devoted to the methods adopted by the Stafford Undertaking to increase gas sales, and all these methods are sound business.

Happy Embarrassment

THE question of coke sales was also referred to in another Presidential Address last week, this being before the Manchester and District Association. The new President is Mr. G. Dixon, of Nottingham, where he succeeded Mr. John Wilkinson twelve months ago; and the position of the coke market in Nottingham reflects the greatest credit on his predecessor. Proper care is taken in the production, screening, and marketing of coke; and not only is there a good demand, but the Undertaking has to refuse orders daily. The coke is made in vertical retorts and is of free-burning nature; and Mr. Wilkinson was able to build up such a demand as to create what Mr. Dixon terms the "present almost embarrassing position." This is an example of what can be done in marketing our chief revenue-producing bye-product; and it is surprising to find undertakings which still do little or nothing to ensure a satisfactory fuel and possess nothing in the nature of a selling organization to deal with it.

Mr. Dixon's address outlines some of the problems confronting our Industry—problems which, as the President says, will not be solved by the academic technician or the accountant, but demand the exercise of the team spirit and full encouragement of youth. The Industry has in its personnel to-day capable young men scientifically trained; and the best way to gain full benefit from their service is for seniors to hand over to them reasonable responsibility for the technical control of modern plant.

In regard to works practice, Mr. Dixon observes that in the daily clamour for higher thermal yield carbonizing plant is being designed to work at so high an efficiency as to require a degree of technical control not dreamed of a few years ago, and he believes that the desire for therms has necessitated temperatures which have outrun the physical attainment of the refractory materials employed, so that maintenance costs are more than outweighing the benefits obtained. He would prefer to see a halt called and attention concentrated upon the possibility of better yields being obtained by blending of coals or other modifications of practice now being investigated. In this connection the mixing and blending plants being erected by the Gas Light and Coke Company, which were described in the "JOURNAL" for Feb. 22 last, will be of untold value to all engaged in the carbonization of coal.

Both Mr. Dixon's and Mr. Poulson's addresses are published in the "JOURNAL" to-day.

Taxation Cases in the Courts

THE attention of readers may properly be directed to the undernoted appeals which have been decided recently, though it will be appreciated that, in the editorial columns of the "JOURNAL," it is not possible to set out the full details of the cases. While these judgments become precedents and of general applicability so far as the principles involved are concerned, the precise facts in question fall to be examined in greater detail in considering their relation to otherwise similar contingencies.

In the case of *Olley v. Brown* it was held that where, in the absence of the appellant taxpayer or his representative—although he had written a letter to the local Commissioners of Income-Tax that he was willing that they should deal with the matter during his absence—on the hearing of the appeal, when the Commissioners arrived at a conclusion of fact, the High Court could not maintain the taxpayer's appeal from their decision, as no question of law arose to be decided. This ruling appears in accordance with the common-sense—as distinct from the legal—view, but serves to emphasize the necessity for a strict compliance with the Statutes relating to proceedings before the Commissioners if a further appeal is to be contemplated.

It was decided by Mr. Justice Finlay in *Cadbury Bros., Ltd., v. Sinclair* that a block of buildings used for the purposes of dining-rooms, kitchens, and dressing-rooms, and connected by bridges and covered ways with the manufactory portion of the premises was properly to be included in the "assessable unit" for the purpose of the proviso to Rule 5 (2) of the Rules applicable to Cases I. and II. of Schedule D of the Income-Tax Act, 1918. This provision enables the *gross* Schedule A valuation to be deducted from profits assessable under Schedule D, in the case of "mills, factories, and similar premises," instead of the *net* annual value. Gas-works are differently assessed to income-tax for the purposes of Schedule A, but where—as usually obtains—the undertaking has part of the premises regarded by the Inland Revenue Authorities as within the definition referred to in the proviso to Rule 5 (2), it will now be possible to claim that the allowance shall apply to property which is an integral part of the undertaking although used only for the welfare of employees or their sporting activities.

This case is not to be confused with that heard in the King's Bench Divisional Court a few days previously—namely, *Sinclair v. Cadbury Bros., Ltd.* The effect of the ruling—which has for obvious reasons but a very limited application—is that the allowance in respect of land rented and occupied by the respondent company is competent notwithstanding that the land in question was exempted from Schedule A tax by a Statute of 1660 passed in the reign of Charles II.

A point of much significance, in view of the prevailing financial and economic depression, was contested in *Henry v. Galloway*. The particular circumstances were that the respondent was a director and vice-chairman of a company, the articles of association of which clearly showed that it was an "office of profit," and, in fact, his salary was specified in an agreement which was not affected when he was appointed chairman and agreed to accept the same remuneration. At a subsequent date he stipulated that he would not accept any further monthly salary payments until the profits of the company were sufficient to cover the debenture interest. On behalf of the chairman, it was contended that the appointment ceased to be an office of profit, for the purpose of assessment to tax under Schedule E, as from the date the salary payments ceased, and the Commissioners accepted this view. On the appeal of the Crown, however, the learned Judge reversed this decision, and held that the mere cesser of payments in these circumstances was insufficient to justify the view that the chairman had ceased to hold an office of profit. The effect is that tax will be payable even although the source of income is not continued and no remuneration has been received during the year of assessment.

Correspondence

Why Not a Women's Gas Association?

SIR,—It was very gratifying to read the suggestion of a contributor in your issue of March 1 for a "Women's Gas Association."

I had the pleasure to make a similar suggestion, in a paper to the "Wales and Monmouthshire Junior Association" in December last, substituting "Guild" for "Association."

In these days of intensive advertising and sales-pushing campaigns every possible avenue for increasing output should be fully explored.

Those in the Industry who are constantly in touch with the consumer realize more and more the need for personal contact, rather than the poster, as a medium for increasing sales. Our cookery demonstrations and exhibitions have surely proved this.

I would suggest fortnightly afternoon meetings, with practical demonstrations of all the latest domestic gas appliances, branches to be formed in all the big centres.

Most of this could be done through local effort. Periodical visits of experts could be arranged for by a central body, adding a little extra incentive.

Manufacturers, I feel sure, would be only too ready to co-operate.

Yours, &c.,
W. J. VINEY.

"Rushdene," Velindre Place,
Whitchurch, Cardiff,
March 11, 1933.

PERSONAL

In their report on the past year, the Directors of the European Gas Company announce with much regret the resignation of Dr. CHARLES CARPENTER, who had been a Director of the Company since 1914, and Chairman since 1925. They desire to place on record their appreciation of his eminent services to the Company during this period. Mr. F. H. JONES has been elected Chairman and Mr. A. M. PADDON, Deputy-Chairman; in conformity with the Articles of Association the Directors have filled the vacancy on the Board, and have elected Mr. S. H. Le ROY-LEWIS a Director of the Company subject to the confirmation by the stockholders at the Annual General Meeting. The Directors also regret to report the resignation, owing to failing health, of Mr. G. C. Goldsmid, who had been an Auditor of the Company since 1916; the Board have, in conformity with the Articles of Association, filled the vacancy, and have appointed Mr. D. M. Touche an Auditor of the Company until the next Annual General Meeting.

* * *

Mr. ROBERT TAYLOR RICHARDSON, for a considerable time Chairman of Barnard Castle Gas Company, left £186,945 gross with net personalty £169,947.

OBITUARY

The death is announced, at the age of 73, of Mr. THOMAS HENRY APPLETON, of Beverley House, Clifton, York. He was a Director of Messrs. Brayshaw Furnaces and Tools.

THE NEWS OF THE WEEK

The Price of Gas at Cupar, Fife, has been reduced by 1d. per 1000 c.ft.

An All-Gas House, for exhibition purposes, is to be organized by the Engineer to the Ilkeston Gas Committee.

A Reduction in Price of Gas by 1d. per therm to domestic consumers, as from April 1, is announced by the Ilkeston Corporation Gas Committee.

Public Lighting.—At a meeting of the Ilfracombe Urban District Council on March 7 a contract with the Gas Company in respect of public lighting for a period of three years, at £1337 8s. per annum, was adopted.

A Company of 170 attended the annual re-union of Kilmarnock Corporation Gas Department. Mr. Charles Fairweather, Manager, was unable to be present, owing to illness, and Mr. R. Fife, Assistant Manager, deputised.

The Fourth Annual Dinner of the employees of the Newton Abbot Gas and Coke Company, Ltd., held at Phillips' Restaurant, proved the most successful on record, Mr. F. J. Prowse presiding over an excellent attendance.

Having Considered Prices for Street Lighting by gas and electricity, the Northfleet Urban District Council recommends the tender of the South Suburban Gas Company for the continuance of the existing gas lighting at £3 10s. per lamp per annum.

Moving the Minutes of the Gas, Electricity, and Transport Committee, the Mayor of Darlington said the income of the Gas Department for the past year was £105,031, and the net profit was £3671. They were proposing a 10% rebate. The Department had reserves of £19,881.

Councillor Isaac Baxter, Chairman of Bangor (Co. Down) Gas Committee, was host to employees of the Gas Undertaking to the number of over sixty in the Administration Room of the Gas-Works. After supper an entertaining programme was contributed. Thanks were conveyed to Councillor Baxter for his hospitality.

One of the Most Attractive Stands at a Trades Exhibition at Stamford (Lincs.) was occupied by the Stamford and St. Martin's Gas Company, whose display included most of the new types of fittings, appliances, &c. Mr. Bernard Clarke, the Engineer and Manager of the Company, reports that an exceptional amount of business was done.

Hereford Corporation Gas Committee reports that a sale will be held at the gas showrooms during the first fortnight in March each year, when 10% cash discount will be given on the purchase of any article from stock, and that in future an allowance of 5% will be made on goods purchased and paid for at the time at the showrooms.

Predicting Even Greater Progress for the Gas Industry in the near future, Mr. George Wright, Engineer and Manager of the Lincoln Corporation Gas Department, in a lecture to members of Lincoln Engineering Society, spoke of the performance of gas-driven omnibuses, with which experiments had recently been made, and suggested that, in the manufacture of these, there was a possible field for Lincoln industries.

Success of Exhibition at Warrington.—Mr. A. Cook, Engineer and Manager of the Warrington Gas Department, has reported that the stand which had been taken by the Department at the Health and Homes Exhibition recently had proved to be very successful, inquiries having been received to the value of £355, while orders already received amounted to £205; also that the cooking demonstrations were very well attended.

Arrangements have been Completed after prolonged negotiations for the supply of gas to Portstewart, Co. Derry, from Coleraine, three-and-a-half miles distant. The Portstewart Council have granted permission to the Coleraine Council to distribute gas to householders within the Urban District, but are not giving any guarantee for the capital outlay or minimum consumption, or have any liability whatever in respect of the venture.

THE NEWS—*continued.*

Institute of Arbitrators.—The next Examination of the Institute will be held in London on May 8 and 9, 1933. Applications to sit must be made on or before April 13. The Council may, at their discretion, exempt candidates from examination in any or all of the subjects if the candidates have passed in these subjects in other approved examinations. Copies of the Syllabus and full particulars may be obtained from the Secretary at 10, Norfolk Street, London, W.C. 2.

Increasing Swiss Gas Output.—The Swiss Gas Engineers' Association has issued a preliminary report regarding the output of gas in Switzerland, which shows that, notwithstanding the ever-increasing use of electricity in the country, the production continues to make steady progress. Thus it is estimated that the total gas output during the past year amounted to approximately 8815 million c.ft., compared with 8483 million c.ft. in 1931—an increase of about 3·9%.

Bradford Corporation Gas Committee have placed on record their high appreciation of the manner in which the Gas Engineer (Mr. E. Crowther) and members of the staff carried out their duties under exceptional difficulties at the time of the recent three days' snow blizzard and the dangerously rapid thaw which followed. In regard to a small gasholder at the Low Moor Works, which collapsed owing to an upright stanchion being smashed when a great weight of snow slid from the top, the Committee have authorized the Chairman, Deputy-Chairman, and Engineer to consider the question of the demolition and removal of the holder, with power to act according to their decision.

Gas Progress in Liverpool.

The Liverpool Gas Company, stated the "Financial Times" in a recent "Potential Investments" column, was established in 1816 and incorporated by Special Act in 1848. In 1926 the Woolton Gas Company was acquired and the area of supply now covers about 67 square miles, with a population approaching 1,000,000, including Liverpool, Woolton, Bootle, Waterloo, Great Crosby, Aintree, and other districts.

The fixed statutory standard price of gas is 12·4d. per therm. The ordinary dividend may rise or must fall ⅛% per annum for each fall or rise of ¼d. per therm. High-class financial and administrative control have benefited both the Company and consumers. In June, 1931, £600,000 of 7% preference stock was repaid and £245,500 of 5% redeemable preference stock taken up. On account of 1932, the usual interim dividend of 3% was paid on the ordinary stock on Aug. 19.

The authorized capital stock is £3,117,472, and borrowing powers are half the paid-up capital stock. The total amount borrowed is £1,130,359, including £30,226 premiums.

Symposium on Coal Utilization.

The British Science Guild is holding a symposium on the Utilization of Coal on Monday, March 27, at 2.30 p.m., in the Lecture Theatre of the Royal Institution. The chair will be taken by Mr. H. T. Tizard, C.B., F.R.S., Rector of the Imperial College of Science and Technology.

Among the papers to be read are: "The Economic Significance of Coal, with special reference to Legislative Differentiation unfavourable to the Natural Expansion of the Coal and Coal Gas Industries," by Capt. Bernard Acworth, D.S.O., R.N.; and "Development of the Use of Gas," by Mr. Stephen Lacey, B.Sc., M.Inst.C.E.

A discussion will follow.

Tickets (free) may be obtained on application to the Secretary, the British Science Guild, 6, John Street, Adelphi, W.C. 2.

BOOK REVIEWS

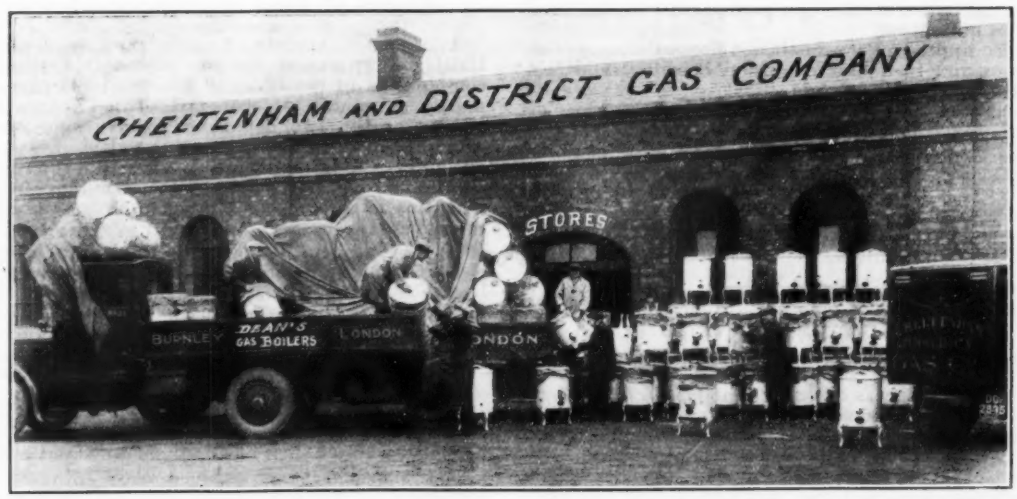
BRUSH UP YOUR GERMAN.

Every official report on languages or salesmanship has urged the need for German, and everyone engaged in any business with European connections knows, not only that the days of "they all know English" are gone for ever, but that Germany's foreign trade with Great Britain is in normal times considerably greater than that with any Continental country.

The latest edition of "Brush Up Your German," by Dr. J. B. C. Grundy, M.A., Ph.D., and Dr. Wilhelm Schöfer (published by G. M. Dent & Sons, Ltd., London and Toronto, 2s. 6d. net) will therefore be welcomed by many business men, containing as it does thirty conversations in modern business German; commercial correspondence; practical and technical word-lists; advertisements and periodicals; maps and diagrams; a vocabulary, together with sixteen topical drawings by P. R. Ward, more practical than usual, but as able as ever.

The conversations are fully as cheerful as those in Dr. Grundy's first volume of "Brush Up Your German," and introduce the reader at once to the more practical side of German business life—getting a consignment through the Customs, salesmanship in the stores, a case in the court, the Leipzig Fair, and so on.

So many existing books of this type promote indigestion through the surfeit of the provisions they supply: detailed discussion of the technicalities of every branch of commerce requires not a book, but an encyclopædia. Let Dr. Meyer take you with him to his solicitor or the income-tax people, or let his charming wife show how a really efficient German secretary does her job—with the English on the opposite page. Many of the conversations are accompanied by the business letters and other documents which refer to them, and correspondence is again dealt with in one of the appendices. Few books can have been published which give such a clear and compact insight into the business methods and commercial vocabulary of modern Germany.



This photograph is of a consignment of boilers being delivered to the stores of the Cheltenham and District Gas Company, and it is being used by the Company for advertising purposes in the local Press. Mr. A. L. Morris, the Accountant and Sales Manager, believes that an actual photograph is of great benefit in this connection.

THE NEWS—continued.

Brighouse Gas Charges.

As from April 1, the following scales of charges will be adopted by the Brighouse Gas Department. Comment on these new rates is made in our editorial columns to-day:

Domestic Consumers.

ORDINARY METERS.

First 5 therms per quarter	10·8d. per therm net.
Next 10 " " "	7·2d. " " "
Next 15 " " "	4·05d. " " "

PREPAYMENT METERS.

First 5 therms per quarter	12·0d per therm net.
Next 10 " " "	8·3d. " " "
Next 15 " " "	5·15d. " " "

ALTERNATIVE RATE.

Fixed charge of 9s. per quarter payable in advance.
Meters set at 40 c.ft. for 1d.
Discount given to make a net charge of 4d. per therm.

The above rates apply to gas used for domestic purposes only. Houses with shops attached will not be charged at these rates. Garages, greenhouses, and the like attached to domestic premises would be included as domestic provided the garage was not let or the greenhouse used for growing flowers, &c., for sale. Briefly, if attached or adjacent premises are used in any competitive trade or business, gas will not be charged at the domestic rate.

Non-Domestic Consumers.

FOUR-PART TARIFF.

	s.	d.	
Customer charge (per meter)	11	0	per annum
Hourly demand charge (per 50 c.ft. of maximum hourly demand)	17	0	" "
Daily demand charge (per 100 c.ft. of maximum daily demand)	6	8	" "

Commodity charge, 3·6d. per therm.
The fixed charge, and the commodity charge, are subject to a 10% settlement discount.

A four-part tariff has been in operation for several years, and the above figures represent the original tariff revised in accordance with present-day costs.

This tariff was designed for trade and industrial consumers. Originally the hourly demand charge was calculated per 100 c.ft. of maxima demand. The revised tariff takes 50 c.ft. per hour as the unit. This is to make it more suitable for consumers with a small hourly load.

A diversity factor of 2 is allowed for in the above charges. In assessing the domestic hourly load where combined domestic and trade premises are concerned a diversity factor of 10 will be allowed for. In other words only one-fifth of the domestic hourly load will be assessed. All the domestic daily load will be taken into account, as the diversity factor of 2 which is appropriate for this load has already been allowed for in the charge.

All street lighting is charged on this tariff.

Alternative Non-Domestic Rate.

First 5 therms per quarter	10·8d. per therm net
Next 995 " " "	6·75d. " " "
Over 1000 " " "	5·4d. " " "

This rate is for those who do not wish to adopt the four-part tariff. It is applied to firms whose demand for gas is so uncertain that the four-part tariff with its fixed charges does not appeal.

It will also apply to very small non-domestic consumers of all classes and to domestic consumers with trade premises attached.

Special Purpose Rates.

POWER.

Flat rate of 2·4d. per therm, with sliding scale based on the net cost of coal as published in the Corporation's accounts of the previous year.

CENTRAL HEATING.

First 2,500 therms per quarter	3·96d. per therm net
Next 22,500 " " "	3·60d. " " "
Over 25,000 " " "	3·42d. " " "

Petrol from British Coal.

Order for Supplies for Air Ministry.

The Air Ministry, it was officially announced on March 7, has placed a contract for supplies of aviation petrol made from British coal. The petrol is produced by Low Temperature Carbonisation, Ltd., as a bye-product in the manufacture of "Coalite" smokeless fuel, and is taken and refined by Messrs. Carless, Capel, and Leonard, of London. This, it is stated, is the first order of its kind ever placed by the Air Ministry.

The quantity ordered, it is officially stated, will be sufficient for ample flying tests.

The new aviation coal petrol, it is stated, has the highest anti-knock value of any petrol in the country, and it does not need any addition of dope or chemicals. It has a negligible gum content. With a view to increasing output of the new petrol, the Askern Works of Low Temperature Carbonisation, Ltd., it is announced, have recently been extended by 50%, and other arrangements also are in hand.

Municipal Economy (?).

"Co-Partners resident in the neighbourhood of the original Hollington Site, Hastings," writes "C. F. B." in the Co-Partnership Magazine of the Hastings and St. Leonards Gas Company, "may have observed that the public gas lamps have been replaced by electric.

"Knowing the ways of our Corporation in this particular matter, they will not be surprised, although they may wonder as to the need for the change. Here are the salient facts:

"When these Council houses were built in 1926, the Company undertook to lay all the mains and services entirely free of charge, and the Corporation had the houses carcassed for gas and agreed that any public lighting should be by gas for at least seven years. The seven years have expired, but in the meanwhile the Company have maintained the lighting properly at the same charge as for equivalent electric lamps.

"It is understood that the cost of conversion of the lamps will be charged on the General District Rate, and one naturally asks what benefit it is *to the ratepayers* to make such a change."

Display Exhibition Planned for Olympia.

Commercial artists are to have an unusual opportunity to display new and original designs for manufacturers at the Advertising and Marketing Exhibition at Olympia next July. The principal object of this display is both to present to manufacturers and other buyers all that is latest and best in modern design, and to enable them to see material whose scope in production has been completely unfettered by any individual requirements.

The Advertising Association has drawn up a list of more than forty categories of display material for which it invites entries, and any contributor may submit as many as six entries for each or any of these categories. Actually, however, intending contributors are not limited to the official list. It has been decided to accept entries only from individual designers, and not from firms.

This section of the exhibition is being arranged under the auspices of the Society of Industrial Art; and competitors should apply for entry forms to the Exhibition Manager, Advertising and Marketing Exhibition, Drury House, Russell Street, W.C. 2.

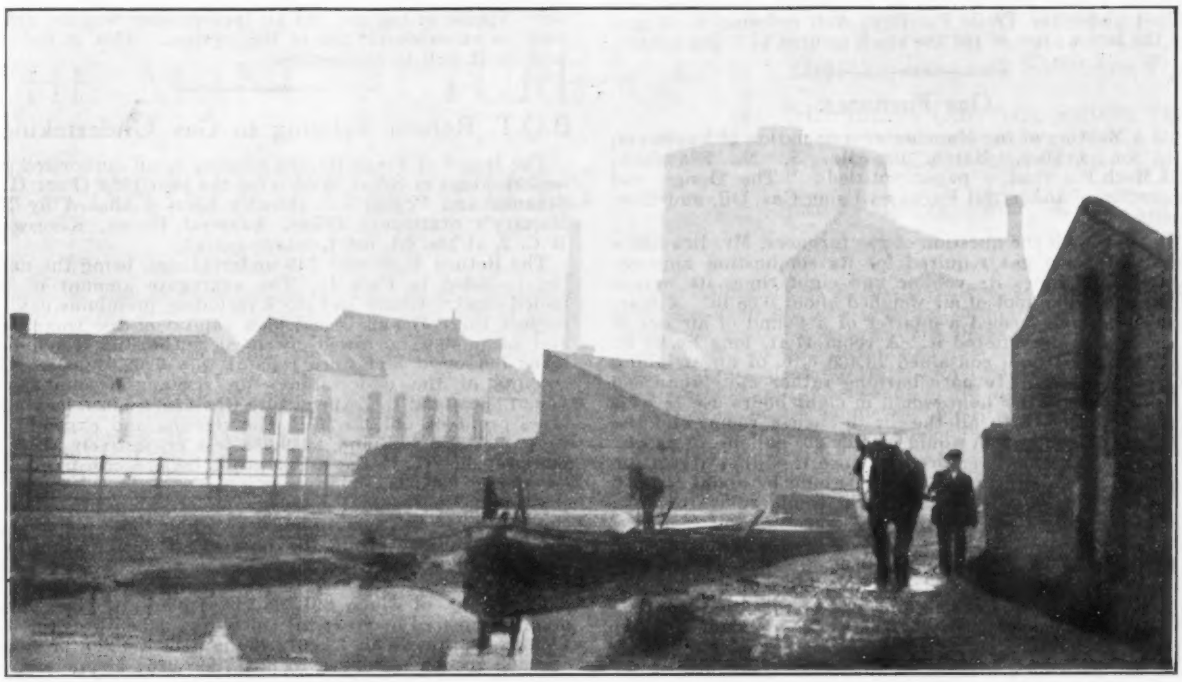
Electrical Idea of Ratepayer's Choice!

A scheme is at present under the consideration of the Hailfax Corporation Finance Committee suggesting the combination of the Gas and Electricity Departments as a matter of municipal economy. The Chairman said Engineers of the two departments have submitted reports which are at present being weighed by the finance authority. Alderman J. H. Waddington, Chairman of the Gas Committee, has expressed the view that such an amalgamation might conceivably be to the best interests of the ratepayers.

The encouragement the idea is likely to receive from the electrical side was illustrated clearly, if not very hopefully, by Alderman T. Hey, Chairman of the Electricity Committee at Halifax, in speaking to a toast at an E.D.A. conference at Bradford last week. At that function Alderman Hey, commenting on the suggested fusion, remarked: "That, of course, would help the Gas Committee to keep alive, help to keep it on its feet, to drag it along with the success that electricity is enjoying. My answer is that every ratepayer is entitled to his own choice of what he likes and no stumbling blocks ought to be put in his way."

This statement was received with enthusiasm by the gathering, as also was another statement at the same function—one amply showing the electrical idea of "no stumbling blocks" to the ratepayer having his choice. This was an announcement that Bradford is erecting an estate of 300 houses in which there will not be a single gas pipe!

A Prize-Winning Photograph



This photograph of the Waterless Holder at Kidderminster took first prize in a recent local competition. The efforts, of which there were seventeen, reached a high standard, and the prize-winning entry is by Mr. Percy G. Hopcroft, F.R.P.S.

Danish Contract Goes to Manchester.

The Municipality of Copenhagen has placed a contract with West's Gas Improvement Company, Ltd., of Manchester, amounting to approximately £150,000 for an extension at one of the principal gas-works in Copenhagen. The contract includes a large installation of the latest type of carbonizing plant. A considerable portion of the work is to be manufactured in Denmark, but a number of the firm's specialities will be manufactured in Manchester.

European Gas Company, Ltd.

The Report of the Directors of the European Gas Company, Ltd., for the year ended Dec. 31, 1932, to be submitted to the members at the Ordinary General Meeting to be held in the Middlesex Room, Great Eastern Hotel, Bishopsgate, London, E.C., on Tuesday, March 21, 1933, states that in spite of the slackening of industrial activity in France and the depression in trade generally, the quantity of gas sold has been well maintained, showing a decrease at the rate of only 0·46%. The number of consumers rose from 160,283 to 162,446, a gain of 2163, or at the rate of 1·35%. After meeting all charges and making provision for French and English taxation, and for renewals and replacements, the profit on the year's operations amounts to £63,708. An interim dividend at the rate of 2½% was paid in October last, and the Directors now recommend that a final dividend of 3½% be paid, making a total of 6% for the year, free of income-tax, and that the balance of £3577 be carried to general revenue.

The works, plant, and mains in France have been maintained, and the necessary work of repair and replacement carried out. At Boulogne, the two settings of vertical chambers with coke sorting and storage plant have been completed and put in action. An opportunity has been taken to acquire suitable premises in a central position in the town to serve as showrooms and offices for the commercial service. Owing to the increasing consumption at Caen it became necessary to provide additional storage, and work has been commenced on a new three-lift holder of a capacity of 12,000 cm. Considerable progress has been made at Nantes with the construction of the new works at Roche Maurice. Practically all the foundation work has been finished, and the fencing and provision of access roads completed. The retort house has been erected and work put in hand on the vertical chambers, coke plant, and boiler house.

The retiring Directors are Mr. W. G. Bradshaw and Mr. C. P. Crookenden, and they with the Auditors, Mr. B. Dennett Holroyd and Mr. D. M. Touche, being eligible for re-election, offer themselves accordingly.

Stanton Ironworks Company.

Comprehensive Operations.

The Stanton Ironworks Company, stated the "Financial Times" in a recent "Potential Investments" column, was incorporated in 1900 to take over the business of the old-established firm of the same title, colliery and blast-furnace owners and ironfounders. Its principal products are cast-iron for all kinds of constructional work, concrete (Stanton-Hume) and other types of pipes for the distribution of gas, water, and sewage.

Among the properties owned are collieries in Derbyshire and Nottinghamshire, blast furnaces at Stanton and Reddings in the former county and (as sole shareholders in the Holwell Iron Company) the Holwell furnaces, near Melton Mowbray. Since 1925 a new colliery has been sunk and equipped at Bilsthorpe, in Notts., with an estimated fully developed annual output of 1,000,000 tons. This has already been completed and a large output is being maintained. The Company also controls James Oakes & Co., James Pain, the Stanton Housing Company, and the Wellingboro' Iron Company, and owns a financial interest in Wilson Bros. Pipe Fittings.

In recent years all the old blast furnaces have been scrapped and rebuilt to suit modern requirements, extensions for doubling the output of pipes have been completed, and a modern slag plant installed for the manufacture of road materials, all of which operations are steadily maturing to their full earning capacity.

Last year's earnings on the ordinary shares exceeded 16¾%. Dividends have been free of income-tax, but the usual interim dividend of 4%, distributed on the increased capital referred to below, was paid less the tax on Dec. 10.

In July last sanction was given to an increase in the capital to £2,500,000 by the creation of 800,000 additional ordinary shares of £1, and approximately 303,000 were offered to the ordinary shareholders at 25s. per share (four new for every 15 fully-paid and for every 20 15s. paid shares). The unpaid liability of 5s. per share on the

THE NEWS—continued.

partly-paid shares was called up for payment on Oct. 1, thereby producing a further £115,625 of new capital.

There is also outstanding £896,700 of 4½% guaranteed debenture stock, 1931-45, out of £1,000,000 authorized and issued under the Trade Facilities Act, redeemable at par. At the latest price of 105 the stock returns 4¼% per annum.

Gas Furnaces.

At a Meeting of the Manchester Association of Engineers, held on Friday, March 10, Mr. S. N. Brayshaw, M.I.Mech.E., read a paper entitled: "The Design and Operation of Industrial Furnaces Using Gas, Oil, and Electricity."

Dealing with the question of gas furnaces, Mr. Brayshaw said that town gas required for its combustion approximately four times its volume and eight times its weight of air. A cubic foot of air weighed about 0·08 lb. A fourteen-stone man pushed a quarter of a pound of air out of a room when he entered it. A room 47 ft. long by 29 ft. wide by 12 ft. high contained 16,400 c.ft. of air weighing 11¾ cwt. A small furnace burning rather more than 500 c.ft. of coal gas per hour would in eight hours use 1½ cwt. of gas together with all the air in such a room, and the products of combustion would include 22½ gallons, or 2 cwt., of water. The heat required to raise this quantity of air from room temperature to 900° C. would be about 504,000 B.Th.U. The same amount of heat would suffice to raise one ton of mild steel through the same range of temperature.

In the case of a furnace using 3 c.ft. of town gas per pound of steel heated, a load of one ton required fully a ton of gas and air. The significance of this was apparent when it was remembered that the specific heat of gas and air was much higher than the specific heat of steel.

In the case of gas furnaces questions frequently arose as to the relative merits of natural draught and compressed air. No complete rules could be laid down because many factors entered into the consideration of each case. The following were some of the leading points to be taken into account.

A fan to give pressures up to about 1 lb. per sq. in. involved some capital expenditure and an appreciable running cost. A compressor to supply air at 2 to 5 lbs. per sq. in. cost much more in the first instance, and used considerable power. Both fan and compressor should be avoided if equal results could be obtained without them.

Gas was commonly supplied from town mains at a pressure of about 2 in. to 4 in. water gauge. Inasmuch as it required eight times its weight of air, it had not, under usual working conditions, sufficient energy at this low pressure to draw in all the air required for complete combustion; consequently the assistance of a "pull" from a flue was required to augment the air supply. Dependence on a flue "pull" meant that the pressure in the furnace chamber was measurably below that of the atmosphere, which caused suction at any crack around the door or elsewhere. There might also be an inflow of air when the door was opened. The energy available in the gas, besides being barely sufficient to induce enough air, was inadequate to effect a proper admixture of gas and air; consequently natural-draught furnaces were likely to work at low efficiency due to the passage of unburnt gas into the flue. Some of the objections referred to above could be overcome, up to a certain point, by care in designing, but if recuperation was applied it was necessary to use large recuperators with slow-moving air currents, and in this case the heating up from the cold took a long time. Even so, natural-draught furnaces had a useful place and were to be recommended in many cases, their chief application being when the temperature did not exceed 750° to 800° C.

Compressed town gas at 1 to 3 lbs. per sq. in. possessed the important advantage that it ensured an adequate air supply without the use of compressed air. Not only would it induce all the air required for complete combustion, but it also had the energy to create high velocities sufficient to effect good admixture and consequently good combustion. The main disadvantage was that gas at such a pressure was liable to cause trouble through leakage.

A compressed mixture of town gas and air was used with excellent results in many cases. The proportions varied. Too much air would bring the mixture into the explosion range. One part of gas and three parts of air by weight made a mixture with ample margin on the safe side so far as explosion was concerned and which required to draw in little more than its own weight of additional air. Such a mixture, therefore, worked satisfactorily at a comparatively low pressure. Machines were on the market for accurately proportioning the initial mixture of gas and air and mixing them intimately, and this system was unrivalled for certain purposes, as when a very short, hot, steady flame was required. Also it had its place for certain kinds of furnace work on a large scale. The considerable expense of the gas and air incorporator was the drawback to an extensive use of this system. Also, it did not lend itself well to recuperation.

B.O.T. Return Relating to Gas Undertakings.

The Board of Trade Return relating to all authorized gas undertakings in Great Britain for the year 1931 (Part II.—Finance and Prices) has recently been published by His Majesty's Stationery Office, Adastral House, Kingsway, W.C. 2, at 10s. 6d. net (postage extra).

The Return deals with 749 undertakings, being the number included in Part I. The aggregate amount of the issued capital (share and stock including premiums paid in respect thereof) and issued loan capital of the companies and of money borrowed by local authorities (including loans borrowed and since repaid) was £202,043,004. The receipts of the undertakings on revenue account were £66,619,805, and the expenditure was £55,286,026, leaving a gross profit of £11,333,779. The receipts and expenditure were £366,995 less and £389,053 less respectively than in the previous year, the gross profit being accordingly increased by £22,058.

The total number of company undertakings included in the Return is 434, being nine fewer than those included in the 1930 Return, while the number of local authorities' undertakings is 315, the same as the previous year. The total authorized capital of company undertakings is £106,563,675, of which £91,208,259 is paid-up. The maximum authorized loan capital (including debenture stock) is £57,768,718, of which £35,072,733 is issued. The profit on revenue account is shown to be £7,292,976—an increase of £228,839.

In regard to the local authorities' undertakings, the total amount of loans authorized is £81,097,457, while the total amount of money borrowed is £75,762,012. The total amount of loans repaid and balance in sinking fund is £45,771,698, while the gross profit is shown to be £4,040,803—a decrease of £206,781. The interest paid on loans, amount of loans repaid, and amount placed to sinking fund during the year is £3,568,014, the net profit working out at £472,789—a decrease of £240,275.

Deal Sports Club Dinner.

The seventh Sports Club Dinner in connection with the Deal and Walmer Gas Company took place on Feb. 24, when Mr. J. F. Tyndall (Manager of the Company and President of the Club) presided. The toast of the Club was proposed by Councillor Cavell and responded to by Mr. F. P. Moodie (General Hon. Secretary of the Club).

Mr. W. Hurrin submitted the toast of the Patrons, President, and Vice-Presidents, which was responded to by Mr. E. H. Hinds, J.P. (representing the Directors).

Proposing the toast of "The Visitors," Mr. Tyndall gave a summary of statistics, and other interesting details of the Deal and Walmer Gas Company for the financial year ended June 30, 1932. The total gas made and sent out was 200,240,000 c.ft., or 951,140 therms, for which 11,416 tons of coal were carbonized. The coke and breeze produced for sale was 5583 tons, while 180,000 gallons of tar were produced. The permanent workmen and staff employed numbered 73, the number of temporary and casual workmen employed for short periods being 16 to 20. The expenditure on the capital account totalled £127,564, and the annual wages bill, exclusive of salaries, was £10,377. Expenditure included £1221 per year for local cartage contractors, £306 for National Health and Unemployment, £1190 as local rates paid direct, and £856 as local rates paid indirectly as coal duty. The capital stock, debenture loans, &c., totalled £149,271, and the Workmen's Benefit Fund in June, 1932, stood at £1703. There were 35½ miles of mains (exclusive of services), while the service pipes totalled approximately 29 miles. There were 5411 ordinary and slot consumers. The gas cooking stoves known to the Company numbered 3386, and the gas heating stoves known numbered 1580. There were 546 street lamps, 333 being in Deal, 200 in Walmer, and 13 in Sholden.

He hoped they agreed with him that the local economic position of the Company was an important factor in the community, alike as ratepayers, taxpayers, and distributors of wages, while the present price of gas of 9·6d. per therm, or 3s. 9½d. per 1000 c.ft., was a reasonable one in East Kent, when they considered the distance from suitable coalfields, from which coal supplies were drawn.

THE MANUFACTURE OF SAND-SPUN PIPES

The London and Southern District Junior Gas Association Visit Staveley Coal and Iron Company's Works near Chesterfield

At least once in each session the London and Southern District Junior Gas Association leave the precincts of London to pay a long-distance visit of inspection to the works of large industrial concerns whose activities are closely allied with those of the Gas Industry.

This year their visit took them further afield than usual, and a most interesting day was spent on Wednesday, March 8, inspecting the works and plant of the Staveley Coal and Iron Company, Ltd., at Hollingwood, near Chesterfield.

Arriving at Chesterfield at about mid-day, the party were welcomed by Mr. D. M. Turner (Managing Director of the Company), and proceeded by 'bus to the Hollingwood Hotel, close to the works, where they were entertained at luncheon by the Company—Mr. Turner presiding, supported by Mr. H. H. Berresford (Commercial Manager), Mr. J. B. Allan (Works Manager), and Mr. T. A. McKenna (London Representative).

The Loyal Toast having been honoured, Mr. Turner proceeded to say how pleased they were to have the Association there that day, and he trusted that they would thoroughly enjoy their visit. The principal thing they had to show them was the sand-spun pipe plant, which, he said, was the only one of its kind in the country, though it was being copied very largely on the Continent and in other parts of the world, and it was turning out what they considered to be a very good product. Their aim was to produce an article 100% perfect, and they would see in the course of their visit what care was taken in the testing of the pipes.

Mr. A. Tennant (President of the Association) thanked Mr. Turner on their behalf for coming there to greet them on their arrival, for his kindness in providing the facilities for their visit, and for the hospitality afforded them. Some of them had travelled nearly 200 miles to see these works, and they were looking forward to their visit very much. He himself had had some personal dealings with the Staveley Company, and he would like to pay tribute to the integrity of the concern.

The Sand-Spun Pipe Plant.

The plant is designed for the production of 80,000 tons per annum of sand-spun iron pipes, varying in size from 4 in. to 12 in., with a laying length in all cases of 16 ft. The pipes, as normally produced, have an integral spigot bead, but beadless pipes, and turned and bored pipes of the same length and diameters, can be made as required.

The process of manufacture consists essentially of pouring molten iron into a rapidly revolving sand mould, the centrifugal effort causing the metal to form a lining of even thickness over the whole of the inner surface of the mould, and this lining on solidification and cooling is the sand-spun pipe. It is evident, therefore, that the plant must, and in fact does, provide for the manufacture of two things—(1) sand moulds, (2) iron pipes—and the following is a short description of the various items of plant.

The first operations seen were those carried out at the jolting stations where the sand moulds are made in the flasks. There are four of these stations, and the chief item of plant in each consists of a jolter capable of handling loads up to 12 tons. The moving tables of these machines carry the socket-patterns; these latter also centre the flasks and the bottom end of the body pattern in relation to each other, in addition to their primary duties.

The body patterns are raised and lowered by means of electric winches, each capable of lifting 60 tons, and when the patterns are in position in the flask, they are centred at the top by means of a tapered socket embodied in the sand hoppers, these latter being used as guides for the sand entering the flasks.

The sand supply comes from rotary bottomed storage bunkers situated above the jolters, *via* flexible jointed pipes, which deliver direct to the hoppers previously placed in position on each flask.

After filling, these flasks are given approximately 100 jolts, the sand hoppers removed, and the groove for the bead then made. The spigot-end plate is next fastened in place by means of 4 bolts, and the mould blacked by a flush of liquid blacking. The spigot-end plate is provided with a groove, into which sand is rammed by hand, so that in no case is the molten metal chilled.

All moulds are skin-dried immediately before their transfer to the spinners. This operation is carried out by means of high velocity gas jets, which inject a large quantity of heated air into the moulds. The gas used is coke oven gas supplied by the Devonshire Works of the Company.

Spinners.

There are seven spinners whose function is to rotate the flasks, containing their sand lining, at such a speed (about 1100 r.p.m.) as to subject the metal to a centrifugal force of at least 75 times that of gravity. Each machine consists essentially of a box framework containing four rollers, two of which are driven, and two idle. The flask is transferred, by means of hydraulically operated manipulators, from the receiving gantry alongside to these rollers, and a safety hood automatically closes the machine, which is then run up to speed.

Molten metal is brought from cupolas in a 3-ton ladle suspended from an overhead travelling crane, and a predetermined quantity is poured from this into a small tilting ladle, supported on a travelling carriage.

All the movements in connection with each spinner are controlled by one operator, stationed at the socket end of the machine—*i.e.*, that end remote from the pouring. He is assisted in the control by means of two electric signalling lamps, one indicating when the machine is up to speed, and the other when the tilting ladle is in pouring position.

Stripping was the next main operation seen. The object is to remove the pipe from the flask, and the plant provided does this in two operations; the first is the removal of a longitudinal strip of the sand mould. This operation consists in passing two tubes, from the ends of which compressed air is issuing, through the sand in the annular space between the pipe and flask. The operation is carried out in a closed chamber called the "blow box," the dust-laden air being exhausted into the main dust extraction system.

The next operation consists of the removal of the pipe by means of one of two hydraulic rams, which pushes the pipe from the flask to a transfer bogie waiting to receive it. After the removal of the pipe, the carriage upon which the flask is resting is tilted to a position about 70° from the horizontal, thereby enabling the used sand to run out of the flask into a hopper and thence to the sand-handling system. The sand reclamation plant is capable of dealing with 25 tons per hour.

The pipes finally pass to a turning and boring lathe if this operation is required by the customer, but in any case all are weighed, hydraulically tested in accordance with B.E.S.A. requirements, and given a rigid visual examination by the Company's Inspection Department. Thence the pipes pass to one of the dipping units, heated in a coke-fired stove, and finally dipped in a tank of heated dehydrated tar solution, the temperature of both stove and tank being under pyrometric control.

The pipes are then stencilled and pass under an overhead crane, by which they are loaded for despatch by road or rail.

The melting plant consists of 3 cupolas each capable of melting 15 tons of pig iron per hour.

Air is supplied by one of two electrically-driven fans, each capable of delivering 6000 c.ft. of air per minute against a head equivalent to 36 in. of water. Each cupola is provided with 10 tuyères, and is designed for uninterrupted periods of working of 24 hours. Every provision is made to ensure that the chemical and physical qualities of the metal, and its temperature, shall be constantly main-

tained within close limits. A well-equipped laboratory is situated within the building, with a metallurgist continually in attendance.

The Devonshire Works.

At the conclusion of the inspection of the spun-pipe plant the visitors had the opportunity of seeing the flexible joint plant and the Devonshire Works, where the Staveley Company's coke oven and blast furnace installations are situated.

The Devonshire Works cover an area of approximately 172 acres, and the first blast furnace started up on this site was lit on July 21, 1907. The present blast furnace plant consists of four modern bell-topped furnaces with 16 Cowper stoves for preheating the air (blast) for smelting the ores, also blast temperature equalizer and dust catcher in connection with each furnace. The output of each furnace per week is in the region of 1100 tons, and to produce the total output of 4400 tons of iron it is necessary to handle approximately 22,000 tons of raw material. There is a very modern gas cleaning plant in connection with the blast furnaces, which consists of three vertical water scrubbers and three Thiessen washers in parallel, each of the latter being capable of passing 2,118,000 c.ft. per hour. The washed gas is utilized partly for heating the stoves on the blast furnace plant, partly for raising steam direct under the tubular boilers, and partly for gas engines.

The coke oven plant consists of 170 ovens, 100 of which are of the waste heat type and 70 of the regenerative type. These ovens have a throughput of approximately 9000 tons of slack per week, the coking time being about 27 hours per oven, and the output of coke about 6000 tons per week.

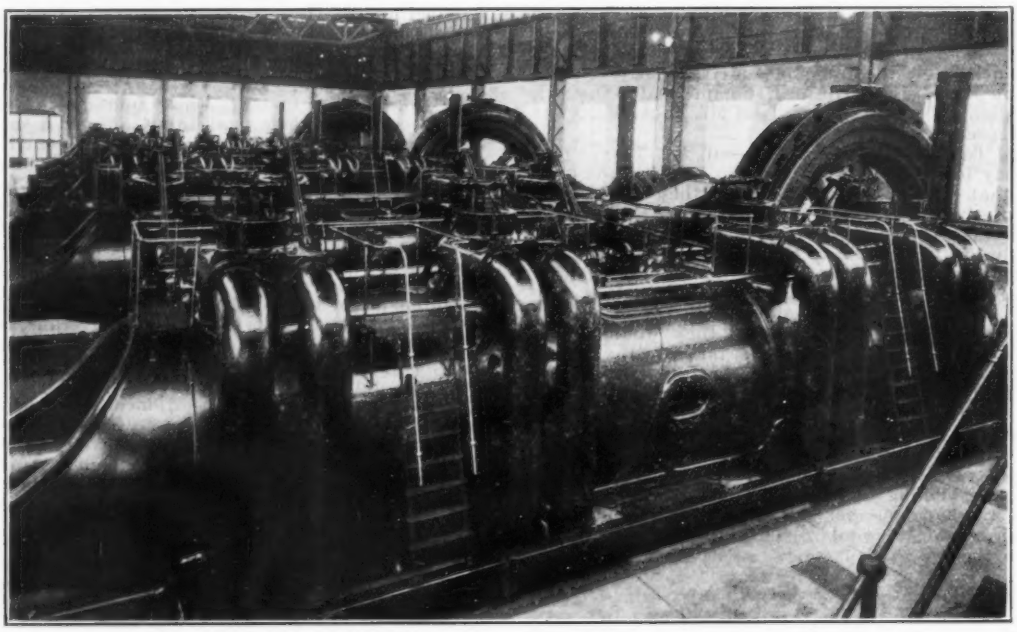
Various of the Company's chemical and bye-product plants were seen, including the benzole and sulphate plants. Among the many ramifications of the concern is the production of tar macadam, soda and bleach, hydrochloric acid, liquid chlorine, nitro benzole, sulphuric acid, nitric acid, aniline, naphthalene, and other tar products.

Gas Engines.

The Association were particularly interested in the gas engines of 7150 h.p. which probably rank among the largest of their kind in the world. The accompanying photograph will give some idea of their immense size.

The engines, of which there are three, are of the double tandem type, manufactured by Messrs. Cockerills, Belgium, each engine having four double-acting four-cycle cylinders 4 ft. 3¼ in. (1300 mm.) in diameter, while the stroke of the pistons is 4 ft. 11 in. (1500 mm.). The main frames are massive iron castings, each cast in two parts and assembled by means of shrunk-steel rings and hoops. The larger part, carrying the main bearing, weighs about 50 tons, and the other part about 25 tons. The crankshaft is a massive ingot-steel forging made up of three pieces—viz., the body of the shaft and the two crankwebs and pins. The shafts with the counterweights complete weigh about 80 tons each. The diameter of the piston rods is 14½ in., while the weight of the crankshaft and rotor is 185 tons. Each engine weighs 1000 tons. The engine frames each weigh 77 tons; the gas cylinders 32½ tons; the connecting rods 11½ tons; and the pistons and rods, per pair, 16 tons. The dimensions of the building which houses the engines are 238 ft. 6 in. long, 101 ft. 6 in. wide, and 70 ft. 6 in. high to the apex of the roof. An electrically-driven overhead crane, capable of lifting 70 tons, is provided for erection and repair purposes.

The gas used for these engines is washed gas of 100 B.Th.U. from the Company's adjoining blast furnaces, and the volume consumed per engine at full load is 95 c.ft. per h.p.-hour, or a total of 637,000 c.ft. per hour. The exhaust gases from the engines discharge into multi-tubular boilers, generating about 14,000 lbs. of steam at 200 lbs. pressure when the engines are working at normal load, and this is superheated up to 300° C. The engine bed, made of concrete composed of river gravel and Portland cement, weighs no less than 5000 tons, and, notwithstanding its huge size, it was built in three weeks, the work proceeding uninterruptedly day and night. The cooling of the engine water jackets, pistons, and bearings requires some 100,000 gallons of water per hour, and the cooling and cleaning of the gas some further 40,000 gallons per hour. Ignition is carried out by means of low-tension trip magnetos and high-tension coils; two ignition plugs are fitted to each end of each cylinder, and each plug is supplied with current from its own magneto, thus obviating any outside source of current supply. The time of sparking of any plug can be retarded or advanced at will while the engine is running.



GENERAL VIEW OF THE 7150-H.P. GAS ENGINES AT THE DEVONSHIRE WORKS OF THE STAVELEY COAL AND IRON COMPANY, LTD.

Two of the engines are each direct coupled to 500 KW. three-phase alternators, 6600 volts at 90 r.p.m., while the third engine is coupled to a 5250 KW. alternator at 97 r.p.m. Situated between the engines are two rotary frequency changers, each 2500 KW., for converting 30-cycle alternating current to 50-cycle, or *vice versa*. A portion of the alternating current generated by these engines is transformed in station transformers to 22,000 volts for external sales. Each engine is provided with an electrically driven barring gear, together with a compressed air starting gear working at 150 lbs. per sq. in.

At the conclusion of the visit, the Association were entertained at tea at the Hollingwood Hotel before returning to Chesterfield Station for their train.

Gas and Gas Coke for Hot Water Supply

From an Address presented by the British Commercial Gas Association at the Joint Gas Conference held at the British Industries Fair, Castle Bromwich, Birmingham, on Thursday, March 2, 1933

(I.) GAS FOR HOT WATER SUPPLY.

The use of gas for water heating is not a new proposition. It is, however, a very large and many-sided one, as the numerous text books and papers which have already dealt with the subject clearly indicate. Gas water heaters have been on the market for many years. Yet in only comparatively few districts in this country is progress to the extent justified by the soundness of the proposition being made.

The proposition is a good one, not only from the users' point of view, but from that of the gas undertaking. It will tend to raise the level of the summer load and thus to decrease the margin between that load and the peak loads of severe winters, caused by the increasing use of gas for heating by all classes of the community.

In America a number of undertakings offer a special summer water heating rate, and one of the largest cities to adopt this plan during the five summer months is reported to have met with great success. In this connection Mr. Stanley B. Finch, Chairman of the Large Scale Water Heating Committee of the Industrial Section of the American Gas Association, has pointed out that "The heating of water with gas for use in apartment houses or commercial buildings during the late spring, summer, and early fall months, the hot water being supplied during the cold months by other fuels, is a matter of great interest both to the gas company and property owner. The apartment house owner has recognized the desirability of gas as a fuel, is fully cognizant of the cleaner, better, and more efficient hot water service that he can give his tenants, but yet it is imperative that he analyze this service in terms of cost and that the gas cost be competitive or nearly competitive with that incurred by the utilization of other fuels. . . . Some companies . . . could very well increase their sales by 10-15% over a period of five years, without materially increasing either distribution or plant investment, by offering a special rate carefully prepared and free from any claim of discrimination. Such a load would be instrumental in helping to straighten out the yearly sales curve, and thus bring about economies in the cost of manufacture and distribution of gas."

PROPAGANDA AND SALESMANSHIP.

The increased sale of gas for water heating in this country can almost certainly be brought about by a carefully devised scheme embodying:

1. Skilful advertising of the proposition—both national and local.
2. Attractive literature for (*a*) domestic consumers, (*b*) large-scale consumers.
3. The provision of special information for architects and builders.
4. Surveys of each district to ascertain the possibilities of introducing gas for water heating.
5. Well organized canvassing schemes.
6. Attractive showroom exhibits.
7. Good salesmanship, both on the district and in the showrooms.
8. Efficient installation work and an efficient maintenance system.

Mention has been made of "good salesmanship." This can hardly reach the highest standards until our salesmen (from the Principals of the undertakings through all ranks to the fitters) are all convinced in their own minds that gas for water heating is a sound proposition. The enthusiasm necessary to ensure general success in this direction will come only from honest conviction on the part of the Gas Industry as a whole that gas for water heating is not only efficient but economical. For this reason a brief examination of some of the points in favour of gas for water heating will not perhaps be out of place.

WHY GAS CAN BE RECOMMENDED FOR WATER HEATING.

There are numerous reasons why gas can be recommended for water heating, some of which cannot be exactly evaluated in terms of money.

High Efficiency of Gas Water Heaters.

There is first the high efficiency of utilization of gas in the water heater. Not only is the efficiency of heat transfer from the flames to the water of a high order, but, as a result of good stratification, thermal insulation and thermostatic control, waste is in a large measure prevented. The joint effect of these features is that the consumption of gas is in practice almost proportional to the amount of water used, rendering it possible to make in most cases a fairly accurate estimate of the cost of meeting any stated service.

An Automatic Supply of Hot Water.

Another reason why gas can be recommended is the fact that, with many of the gaseous systems of water heating, the production of hot water is absolutely automatic. Those householders who have never experienced the boon of an automatic supply of hot water are sometimes slow in appreciating this characteristic in the abstract; but it is one which every salesman should bring to the notice of his listener at the outset.

Saving in Space.

A further reason why gas for water heating is advantageous is the saving of space which results from its use. The present-day tendency in this country is to live in smaller and more compact houses than in the past. A system of water heating which releases the space originally required for the storage of fuel is thus at a distinct advantage. This saving of space can often be evaluated in terms of saving in rent—or of the interest on capital involved in the provision of storage space, and will often apply in the case of blocks of offices, bank premises, and other buildings in which space is limited or very valuable.

The freedom from excessive heat in the room in which the water heater is placed, the quality of cleanliness, and the reduction of labour, need not be stressed to gas men, nor need the unfailing nature of the fuel supply, and the absence of dirt, work and worry in obtaining delivery.

Up-to-Date Household Equipment.

A point of view, however, which is not always given as much weight as it deserves when approaching householders, builders, and architects, is the fact that a house equipped with the most suitable type of gas water heater, properly installed, and with pipes adequately lagged, is, in this respect, absolutely up-to-date. Where its sale is in question, too, it is likely to be disposed of more quickly than a house lacking in an efficient and economical hot water service.

It may be noted here that architects are always interested in having full details of what gas-fired water heating appliances will do, what they cost, and what advantages they can name in recommending them to their clients. It must always be remembered that the designers of buildings, small or large, like to have those buildings equipped on lines which are distinctly modern in all respects. If the architect is convinced that gas is the best fuel for water heating, there should be little difficulty in securing an installation of gas-fired water heating equipment in new buildings. The Association and some gas undertakings have shown their appreciation of this point by preparing from time to time special information suitable for architects, and by keeping in very close contact with them. Much still remains to be done, however, in this direction in some districts.

Wide Range of Gas Water Heating Appliances.

Again, the Gas Industry is fortunate in having a fuel which has the widest of ranges in utilization, so far as water heating is concerned. Efficient gas-fired water heaters can be provided with consumptions varying from, say, 10 c.ft. up to thousands of cubic feet per hour, the larger units being available for use in batteries, if necessary. The majority of these appliances can be controlled automatically as regards the temperature of the water supplied, and, if necessary, timing of operation.

Systems of Control.

Systems of automatic control for gas-fired water heating appliances have received very careful attention on the part of both apparatus manufacturers and those in charge of the research laboratories of the larger gas undertakings throughout the country. These controls have already reached a high state of accuracy and reliability.

Gas-Fired Appliances to Meet All Hot Water Service Needs.

Time need not be occupied here by reading out a detailed description of the various types of water heating appliance. The types may be summarized, however, as follows:

(*a*) The thermal storage gas-fired water heater—small, medium, and large.
(*b*) The gas-fired circulator.
(*c*) The one-point instantaneous gas-fired water heater (geyser).
(*d*) The multi-point instantaneous gas-fired water heater.
(*e*) The gas-fired instantaneous water boiling appliance.
(*f*) The gas-fired wash boiler.
(*g*) The gas-fired washing machine.

In this range of appliances there is to be found one or a combination which will meet the hot water needs of the smallest prepayment consumer, of the medium-sized or large household, or of the largest restaurant, business establishment, public institution, or factory. The development of the calorifier for indirect heating should not be forgotten. This appliance has made practicable (and also sound practice) in some cases the use of one gas-fired boiler for providing the dual service of central heating and hot water supply.

TYPES OF DEMAND.

An aspect of water heating that is worthy of a paper to itself is the type of demand in various circumstances. Appliances are available to meet all types of demand, but a correct selection for a particular case can be made only by considering the details.

The most common types of low consumption storage heater consume gas at a maximum rate of 10 c.ft. per hour (say 5000 B.Th.U. per hour), which corresponds to a recovery rate of hot water of four gallons per hour raised 90° F. The volume of the storage tank varies from 12 gallons to 40 gallons. If therefore hot water is drawn at rates higher than four gallons per hour the storage disappears at a corresponding rate. Naturally therefore the size of the storage tank suitable for a given job depends upon the maximum demands for hot water, and clearly not more than an average of 96 gallons at 140° F. per day can be obtained.

Although the quantity of hot water obtainable from this type of appliance is limited, the appliance is so designed as to meet adequately a type of demand for hot water that is very common. Its method of operation definitely discourages waste. It has the added advantages that it is simple and cheap to install.

With a view to meeting a large peak demand and including the advantages of storage the so-called high consumption storage units are provided. These consume up to 100 c.ft. per hour, and therefore have recovery rates of up to 40 gallons per hour, which, when combined with insulated storage of 20 gallons or more, make a fairly powerful unit.

In contrast with the storage units already alluded to, there is the instantaneous water heater which, while having no storage, will supply continuously a given quantity of hot water raised 40° F. (or half this quantity raised 80° F.). This type of heater (varying in size, of course) will supply from about 60 up to 900 gallons or more per hour immediately upon demand, and will therefore sometimes meet requirements better than any of the storage units. Even ordinary small bath geysers will heat up water at a rate of 150 gallons per hour, raised 40° F.* (or 75 gallons raised 80° F.), which is a faster rate than that of a powerful storage heater. In this connection, however, it is useful to remember that with the latter the *rate of production* of hot water is not always the same as the *rate of delivery*. One advantage of even a small storage heater is that the hot water accumulated in the storage tank can be quickly transferred to the bath.

Although the above outline only touches the fringe of the subject, it will probably be sufficient to show that the same type of heater is not able to meet all types of demand. None of them is "best." It is a matter of fitting round pegs into round holes and square pegs into square ones.

TESTING WORK.

The practical problems connected with the supply of hot water to the ordinary house have been covered by many excellent publications and papers during the last few years. These have dealt with some of the difficulties experienced and have indicated the solutions in many cases. The finding of those solutions, however, has not always been a simple matter. Frequently it has been the result of months of carefully co-ordinated work in the laboratory and on the district. The services rendered to the industry as a whole by these laboratories of the larger undertakings and appliance manufacturers is sometimes not fully appreciated by the smaller undertakings who benefit from their work.

In the matter of testing only, the ordinary routine work in the laboratories of some of the larger gas undertakings is considerable. It is fortunate for the Gas Industry that an appliance tested and approved in one laboratory of recognized standing can generally be adopted by other gas undertakings throughout the country, attention being paid, of course, to the differences in calorific values of the gas supplied.

RECENT DEVELOPMENTS IN HOT WATER SUPPLY.

Research work is steadily enlarging the number of cases in which gas can be used for water heating, and it will perhaps not be out of place here if we examine briefly some of the developments of recent years.

Importance of Insulation.

A point to which attention may first be called is the importance of efficient insulation in hot water work. To attain full success in the water-heating field the Gas Industry must take every opportunity to reduce heat losses to a minimum in every installation.

Efficient Insulation.

The advantage of lagging attains its highest value in connection with storage systems, where considerable quantities of hot water have to be kept in reserve for periods of anything up to several hours. In the case of the low consumption storage water heater, effective insulation is necessary not only in the interests of economy, but to ensure the functioning of the appliance. If effective insulation were not provided, the heat losses would represent an unduly large proportion of the total amount of heat actually developed by the heating unit. The advantages of lagging may therefore be regarded under two headings: (*a*) the avoidance of waste, (*b*) improved service.

In regard to (*a*), Mr. C. A. Masterman, in his paper* read in 1929 before the London and District Junior Gas Association, pointed out that "the gas saved in consequence of moderate lagging will never be less than 10%, and may exceed 50%." When using gas costing, say, 8d. per therm for domestic water heating, about one-halfpenny per week can be saved for every foot run of 1 in. hot water flow pipe efficiently lagged. Piping for this service can be lagged at a cost of from 8d. to 1s. per foot run. Thus it will be seen that the initial cost of lagging is covered by the saving in gas in from four to six months.

As regards (*b*), it should be remembered that flow pipes contain hot water during the whole time the heater is in use. It is therefore always advisable to insulate them, not only to avoid waste of gas, but to ensure a good "service." A different condition prevails, however, in the case of branch pipes leading to handbasins and sinks. Water is usually not in continuous circulation through these pipes, so that it is generally necessary to draw a certain amount of cold or tepid water at the taps before hot water is obtained. Whether it is advantageous to insulate these branch pipes depends upon certain factors. If, for instance, water is drawn at the taps only once or twice a day, any hot water contained in the branch pipes would cool down, whether they were insulated or not. It is seldom, however, that hot water is so infrequently drawn as not to justify the use of lagging. The matter is therefore one for local consideration; but it should never be overlooked.

Several forms of lagging material are available. Some are cheap, and adaptable to small domestic installations where costs have to be kept down to a low level. There are other materials, however, which, though more expensive, make a somewhat better job.

Stratification of Hot Water.

It is a well known principle in physics that hot and cold water may exist together in the same tank, provided the hot water is uppermost. The difference in the densities is sufficient to prevent rapid mixing. To make the separation as effective as possible, it is desirable that the height of the tank should be large in relation to the cross-sectional area, thereby lessening the area of contact between the hot and cold waters.

The importance of effective stratification in storage heaters is obvious, especially in the low consumption type of heater. It enables the user to draw off the hot water from the tank with a minimum mixing of cold water. Where stratification is effective, really hot water may be drawn off from the top of the tank, even though the bulk

* NOTE.—Although the nominal output of geysers is based on a temperature rise of 40° F., it is generally agreed that higher temperature rises are called for in practice, the output of course being proportionately lower.

* NOTE.—"Thermal Insulation (with especial reference to Domestic Hot Water Supply Installations)."

of the water in the tank is cold. Any test of a low consumption heater should include an examination of the stratification effected.

An otherwise excellent installation may easily be marred by a bad arrangement of pipes, causing a small volume of usefully hot water to become a large volume of tepid water which is of no use.

The following figures show the results of good and poor stratification.

Two storage heaters, each consuming 10 c.ft. of gas per hour, were started from cold, and the gas was allowed to burn for half an hour. The 5 c.ft. of gas consumed in each case should be sufficient to produce, in a well-designed appliance, two gallons of usefully hot water.

Example A.	
Temperature of Successive Gallons of Water Drawn Off.	
	°F.
1st gallon	130
2nd ,,	115
3rd ,,	90
4th ,,	75
5th ,,	70
6th ,,	68
7th ,,	67
8th ,,	67
9th ,,	67
10th ,,	67

Example B.	
Temperature of Successive Gallons of Water Drawn Off.	
	°F.
1st gallon	79
2nd ,,	79
3rd ,,	79
4th ,,	78·5
5th ,,	78
6th ,,	76
7th ,,	75
8th ,,	75
9th ,,	74
10th ,,	73

Example A shows that the desired result was obtained and illustrates the effectiveness of the separation of the hot from the cold water. Example B shows that the heat applied to the water was diffused throughout the whole bulk, and that, although the heat content of the bulk was considerable, no usefully hot water was available.

Condensation.

One of the products of combustion of gas is water, and this may leave the apparatus partly as vapour and partly as liquid. In the design of water-heating appliances there is a difference in practice at the present time. Some designs aim definitely to avoid the formation of condensation without sacrificing thermal efficiency, whereas others go almost to the other extreme of encouraging maximum condensation so as to utilize as much as possible of the latent heat of the water vapour. If anything approximating to complete condensation is attained, it may be necessary to provide some mechanical means of ventilation, as, for instance, an electric fan, so that the flow of air through the combustion chamber can be maintained.

The allusion to condensation prompts a few remarks upon the basis for calculating the thermal efficiencies of water heating appliances.

Most of the makers of water heating appliances, particularly of the large kind, gave data regarding the thermal efficiency of the appliances they make. In some cases the efficiency given is calculated on the net calorific value of the gas consumed. Although there are certain obvious scientific reasons justifying this method of calculation, it seems desirable from a commercial point of view that the gross calorific value should be taken as the basis. When a therm of gas is sold to a consumer it is understood that this therm includes the latent heat of the water vapour produced by combustion. A consumer is entitled to know how much of this therm he might reasonably expect to obtain in useful heat. It is for this reason that the Gas Industry favours thermal efficiencies being always calculated on the gross calorific value.

Nature of Water.

Extremes of "hardness" or "softness" in the local supply of water raise one or two problems for the hot water engineer. Very soft water is met with in many of the Midland and Northern towns of this country, and, generally speaking, very hard water in the South.

Hard Water.

Partial or complete decomposition of the bicarbonates of lime, &c., from hard water must of necessity take place at certain temperatures. When such water has to be heated up, much trouble can be saved by thermostatic control and by using a water heater so designed that any solid matter deposited in it is not exposed to conditions which cause that solid matter to harden. If this point is not attended to and the solid matter does harden, its removal is rendered difficult and the thermal efficiency of the appliance is considerably reduced. This drawback of hard water is sometimes alleviated by the use of a calorifier. Appliances incorporating the principle of the calorifier and also ensuring effective stratification of the water are now available. The trouble is also overcome in some houses in which a water softener for softening the whole of the domestic water supply is installed.

Soft Water.

Very soft water causes difficulties of another kind. Ferrous materials tend to corrode rapidly when soft water passes through them; so much so that often the only solution is to use copper, bronze, or bower-barffed iron water heaters, copper tanks, tin lined, and pipes of tinned copper. If these steps are not taken, the heated water is likely to be discoloured by the products of corrosion.

Combustion.

During the past ten years considerable progress has been made in the improvement of combustion in gas-fired water heating appliances. The research work done in the laboratories of manufacturers and gas undertakings, and at Leeds University and elsewhere, has now made it possible to build appliances that fulfil the most exacting specifications as regards combustion.

Excellent Finish of the Modern Gas Water Heater.

Gas water heating appliances of all types are now being well finished by the manufacturers. A comparison of these finishes with those of appliances produced only a few years ago offers striking proof of the manufacturers' recognition of the fact that efficiency is not the sole end. A gas appliance to-day, if it is to be sold in large quantities, must not only be up-to-date in internal design; it must also look up-to-date. Appearance is a quality which appeals not only to householders and shopkeepers, but also to architects and builders.

Safety Cut-Outs.

The increasing use of water heaters on prepayment gas supplies brought with it the necessity for automatically closing the supply pipe to the appliance if the meter ceased to supply gas. A simple and effective device to meet this need has now been put on the market.

From consideration of some of the recent general improvements in gas water heaters it might be well to turn now to a few applications of gas to specific problems.

Gas in the Home Laundry.

Attention may be called first to the large field still open for the sale of gas in connection with laundry work in the homes of the poor as well as of the better-to-do. So far as the latter are concerned, it may be pointed out that many people who, a few years ago, sent out all of their washing to be done by the professional launderer, now prefer for various reasons to do some of this work at home. To these people the gas washing machine should have a ready appeal.

The Gas-fired Wash Boiler as a Bath Water Heater.

In small houses where economy in the capital cost of equipment for the houses is an important consideration, the gas-fired wash boiler is in some cases being used not only for laundry purposes but also for providing hot water for baths. There are various ways in which it has been suggested that this dual service can be provided.

Hot Water for Tea and Coffee Making.

There is at least one other direction in which gas water heating apparatus might be pushed to a greater extent than is done at present. Those who have to travel about the country a great deal in the course of their duties find very frequently that the tea and coffee provided in many catering establishments leave a great deal to be desired. In most cases the poor drinks provided may be attributed to the fact that they are not made in the proper way. The Gas Industry can help considerably in this matter by providing ideal appliances for ensuring a supply of boiling water for this purpose. These appliances are designed somewhat on the lines of the instantaneous heater, but in such a way that water cannot be drawn unless it has actually reached boiling point. It is well-known of course that when tea is made in urns, in which it may be in a state of ebullition for quite a long time before use, it is not perfect tea because of the de-aeration of the water. With the proper gas appliance the water does not boil until it is required to be drawn, so that the ideal conditions for good tea making are assured. The appliance, in fact, delivers boiling water in the same condition as obtains when water is heated in a kettle and used immediately it boils. Some of these appliances are designed to work at a slight pressure so that the temperature of the water immediately before it leaves the apparatus is a few degrees higher than the boiling point.

Large-Scale Gas Water Heating.

Gas for water heating on a large scale is making fairly good progress to-day. Experience in the use of gas for

cooking in large restaurants, canteens, and the like, has convinced many business men and women of the real economy of this fuel, because it can be used in an efficient manner and without waste, and because it involves little labour and creates no dirt. This satisfactory experience has encouraged them to explore also the possibilities of using gas for water heating; and many have now found gas for this purpose to be an equally sound commercial proposition.

Gas in Sports Pavilions and Public Bathing Establishments.

Perhaps one of the most interesting developments in the last few years has been the use of gas for water heating in sports pavilions. Here gas is undoubtedly the ideal fuel because of its flexibility—its capacity to deal efficiently with greatly varying loads. One need but refer to-day to such installations as those in the All-England Lawn Tennis Club at Wimbledon and in the White City Sports Stadium at Shepherds Bush. Reference must also be made to the growing use of gas for water-heating in public baths.

LOOKING TO THE FUTURE.

The importance of hot water supply as a means of developing at any rate the summer load of the Gas Industry cannot be over-stressed. By increasing the use of gas for water heating, the industry will find itself in a better position to encourage the use of gas for central heating. The industry does not want to lose the great opportunities now opening up to obtain the heavy winter loads offered by central heating in cases where coke is not suitable. The proposition, however, can only be made a thoroughly sound one by providing a greater outlet for gas during the summer months.

This section of the paper should not be brought to a conclusion without calling attention to the real necessity for the Gas Industry to get together—the sooner the better—to discuss not only methods of charge for gas used for water heating, but general policy in regard both to selling methods and maintenance in relation to the water heating business. Gas undertakings, situated perhaps within a few miles of each other, may be working on entirely different lines. One undertaking, for example, may have agreed to cash, hire-purchase and hire terms in respect of water heating apparatus installed; the others may have adopted only one or two of these methods of payment. One may include fixing charges in hire and hire-purchase terms; the others may make fixing charges a cash transaction only. One may have adopted standard prices for fixing standard types of water heater; the others may charge actual cost (or more) for fixing, based on the individual job. One undertaking may be doing quite good business in the provision of small storage or instantaneous type water heaters for the sink or hand-basin—an excellent means of introducing in a small way the advantages of the *automatic* hot water service provided by gas, which may lead to further business later on; others may hardly have touched this line of business. There is no need here to lengthen the list of variations in selling policy. Again, some undertakings have already organized an efficient maintenance system; others have done little or nothing in this direction. Surely it is high time that our great industry had a more co-ordinated policy throughout the country—at any rate in some of the directions indicated.

(II.) GAS COKE FOR HOT WATER SUPPLY.

Much that has already been said regarding the production of hot water by gas applies also to gas coke. An increasingly common practice in this country and in America is to use coke as fuel during winter months and gas during summer. This combination has several advantages from both the consumer's and the Gas Industry's points of view. The fuel cost of producing hot water is greater in winter than in summer, for two main reasons: (*a*) The cold water temperature is substantially lower in winter as compared with summer, and (*b*) heat losses are generally greater. In addition to these points, the need for hot water in winter is greater than in summer because of the general prevalence of colder conditions. These factors naturally compel one to give attention to coke as a cheap alternative to gas.

Considerable success has been achieved in the design of coke boilers, having in view modern requirements such as automatic control, simplicity of operation, appearance, &c. Special grates permitting of the easy removal of ash and the prevention of clinkering go a long way to avoid the troublesome drawbacks of the earlier types of coke boiler. Ignition also is reduced to its simplest and cheapest form by the use of gas. Other attractive features of modern coke boilers are the provision of hot-plate facilities for cooking, as well as a cheerful open fire.

A great advantage to the Gas Industry in the use of coke in winter and gas in summer for water heating is the tendency for this practice to level up the demand for gas and coke over the year. It is generally admitted that the cultivation of good and profitable markets for coke has a favourable effect upon the cost of gas; and on this ground it would seem that the use of coke for purposes where fuel cost is the prime consideration should be encouraged. Of course, coke does not lend itself nearly so easily to full automatic control as does gas. The potentialities of the domestic market for coke and its possible influence on the price of gas have not always been fully appreciated.

It must not be forgotten that, if the use of coke is to be popularized, the appliances must not only be efficient but also attractive. Modern coke boilers are now available which fulfil very well the popular requirements regarding appearance. They can be obtained finished in enamel that will withstand all but the most careless treatment.

At the time it was formed in 1913, the London Coke Committee, recognizing the importance of developing the coke market by providing suitable, efficient, and attractive coke appliances, issued a standard specification for domestic coke boilers. This specification, which was drafted on broad lines as a guide to boiler makers, called for cast-iron and welded-steel boilers provided with hot plates to facilitate minor cooking operations; and, among other important features, right- and left-hand flow and return tappings to facilitate installation and connection to existing hot water pipes; damper controls to regulate flue draught; fuel space to allow for continuous working with a minimum of attention; the elimination of flimsy fittings likely to give trouble; and also the provision of adequate access doors to facilitate internal cleaning. All new coke boilers have since been tested as they appeared on the market, and only those which comply with the specification have been approved for recommendation. On their part, the gas companies associated with the London Coke Committee have paved the way to satisfactory and economical operation of the boilers by providing coke graded in appropriate sizes, those sizes being adopted by all the producers concerned. That the standard sizes of coke adopted by the Committee fulfilled every requirement of domestic consumers is proved by the fact that they are still in use up to the present time and have been more or less closely followed by many other undertakings, as well as by producers of furnace coke and other competing fuels.

Owing, however, to certain difficulties, it was not until after the war (in 1921—only twelve years ago) that the first modern boiler was produced in accordance with the London Coke Committee's specification. There are now more than twenty firms, including gas stove manufacturers, making and selling coke boilers which have already come to be regarded as standard kitchen equipment in many new houses. The total number already in use in this country has been estimated at more than 400,000, and the combined total yearly output of coke boilers is probably more than 120,000. One of the largest makers of domestic coke boilers, whose output has reached 70,000 per annum, has stated that the boilers sell mainly in London and the South.

About 40,000,000 tons of coal are used annually for domestic purposes. The total yearly output of gas coke is about 8,000,000 tons, and it is in the interests of the Gas Industry that this huge domestic market should be cultivated. Probably one-third of the coal, namely, over 13,000,000 tons, is used annually in heating water for purposes other than cooking. This figure affords a striking illustration of the potential market for good coke-consuming appliances for the production of hot water. Allowing for replacements, the present annual output of coke boilers should necessitate an annual increment in demand for graded gas coke of more than 300,000 tons, assuming an average yearly consumption of only two to three tons per boiler. This large potential increase in demand for gas coke in the most lucrative of all fuel markets cannot reasonably be regarded as direct competition with gas.

The valuable work of the National Smoke Abatement Society and the Committee for the Investigation of Atmospheric Pollution has done much to arouse the public conscience against the use of smoke-producing fuels. It has been proved beyond question that the loss represented by coal smoke amounts to an enormous figure. Coupled with it is its incalculable and detrimental effect on public health. For these reasons alone the way should be open for a large extension in the use of gas coke, which is relatively cheap to use, produces no smoke, and is a home-produced fuel.

Much use can be made of the Gas Industry's goodwill and friendly personal contact with its thousands of consumers to encourage the use of gas coke. That every advantage should be taken of these opportunities to promote the use of coke by everyone privileged to represent a gas undertaking in any capacity will no doubt be conceded by all who fully appreciate the nature of the competition confronting the industry at the present time.

Coke appliances do not cover the wide range of require-

ments that is covered by gas consuming appliances, and frequently the natural alternative to meet special needs is the use of gas. In a large measure gas and coke are complementary and not competitive with each other.

The real significance of the fact that the world production of fuel, actual and potential, is far in excess of present demand, is perhaps not always fully appreciated. Everywhere output exceeds demand. This is especially true of oil fuel, which is an unavoidable by-product of petroleum distillation. Naturally, therefore, competition, local, national, and international, of ever increasing intensity must be expected.

Mr. J. G. CLARK, Technical Adviser to the B.C.G.A., who presented the paper, said how greatly indebted the Association is to the Technical Adviser to the London and Counties Coke Association, to the Gas Light and Coke Company's staff at Watson House, and to the various makers of water heating appliances for the considerable and valuable assistance they gave in the preparation of the paper; also to members of the Executive Committee for their constructive criticisms.

Discussion.

The CHAIRMAN (Mr. R. E. Gibson) said they were fortunate in having had that paper, because even those who had been making some progress in the matter of gas for water heating had not gone far enough. He thought they would all acknowledge that. In his own Company at the present time they had made up their minds to go in for an intensive campaign throughout Liverpool to see what they could do to extend the amount of gas consumed for water heating generally, and he was sure the paper would prove invaluable to them.

Mr. W. N. WESTLAKE (Exeter) proposed a hearty vote of thanks to Mr. Clark for reading the paper. He said it was felt in the Industry there was a real opportunity for the extension of the use of gas and coke for water heating, and the paper had been prepared by the B.C.G.A. to give a lead to the Industry to see if they could not simultaneously throughout the country secure greatly increased business in this direction. He suggested that the habits of the people were changing, and people now wanted baths where a few years ago they only had them at long intervals. He believed there was a real opportunity for the Gas Industry to get hold of this business; if they did not, someone else would do so. He urged the necessity for balanced selling in this matter. They had two products to sell which would give hot water, one was gas and the other was coke. It would be to the interests of the undertakings generally if they went out for balanced selling and recommended coke where it was better and gas where it was preferred. That meant that they would have to have, and ought to have, an investigation before any apparatus was recommended. They could not install hot water aparatus with the same ease and facility that they could put in a boiling ring or a cooker. Mistakes were made, and he warned them of the danger of fixing new apparatus on to an old system. They must also have trained assistants; it was no use putting an ordinary fitter on to this work. If they went in for this extension and did it on a false foundation they might rue the day when they started it. They should also see that the apparatus was adequate for the needs of the family. If only one bath was wanted in the morning they could install different apparatus to that which would be necessary if three or four were required. He thought the paper would be extremely useful to pass on to the staffs for reference.

COKE OPTIMISTS ON THE INCREASE.

Mr. E. W. L. NICOL (Technical Adviser to the London and Counties Coke Association), in seconding, said he was most interested in the coke boiler section of the paper. When he joined the London Coke Committee in 1913 both inside the Industry and outside there were many coke pessimists. Coke stocks were high and prices were low. To-day, they had a large and increasing number of coke optimists; and one of them was an electrical engineer who saw in the coke boiler the salvation of the otherwise "all-electric" house. In a paper which he read at the Institution of Electrical Engineers, this electrical engineer had said he could see the time coming when the Gas Industry would be quite unable to supply the gas coke required for coke boilers, and that he would have to fall back on the coke oven industry to supply the coke. He (the speaker) believed that was a fairly true picture of coke's future. He did not say in a matter of two or three years, but, probably, in ten or fifteen years the coke required for central heating and domestic coke boilers and open coke fires would be sufficient to absorb all the surplus coke that was produced by the Gas Industry. There was, of course, no practical limit to the possible output of gas coke. The present world production of fuel, actual and potential, was greatly in excess of demand; and, as they knew, the consumption of coal in this country had diminished in the past fifteen or twenty years by nearly 20 million tons. In a diminishing market the use of one fuel could only be extended at the expense of another; that was to say, for every additional ton of coke sold there was, inevitably, a ton, or the equivalent of a ton, of some other fuel displaced. That gave them some idea of the competition which coke, and gas, had to meet at the present time. Competition, as they knew, was not only local; it was national and international. They had to go into the market not only against coal and other smokeless fuels, but also against fuel oil from America, Russia, and other foreign countries. Gas and gas coke were complementary and interdependent. Any fuel that competed with coke attacked also gas in its most vulnerable quarter. The coke boilers produced up to now were very admirable in many ways, but they were not altogether satisfactory, because the makers did not know whether coal or coke was to be used as fuel, and consequently they sent out boilers fitted with grates suitable for the most friable coal that was likely to be used, and the proportion of free air space in the grates, therefore, was usually quite inadequate for use with coke. The ash from the coke could not get away freely, and it was fused into clinker. This led to a large number of complaints. The clinker was attributed to the quality of the coke, when really it was the boiler grate which was defective. Coke was therefore unfairly discredited, and a great deal of business was lost to more expensive fuels. He had consequently felt it his duty to get out a design for a gas-ignited coke boiler which, he believed, would be satisfactory. He had had the advantage of the criticism of the Technical Committee of the London and Counties Coke Association, and the first finished model of the boiler was on show in the exhibition. He would be very glad of any criticism they might care to make.

A CONTROVERSIAL STATEMENT.

Mr. H. E. BLOOR (York) said he thought the paper would be very helpful to many, but he had the basic criticism to make of its being presented there. He thought the B.C.G.A. was wrongly named if it was going to take upon itself the duty also of being a propagandist for coke. "I firmly believe," he said, "that the future of the Gas Industry is not linked up with and does not depend upon coke." He did not think that Mr. Nicol should have been there that morning except as an interested observer. He was not antagonistic except to the Gas Industry refusing to face the facts. It was time the truth was told and he was going to tell it. He was going to make a statement which might be regarded as highly controversial, and it was that the Gas Industry could not continue to function in this country on the basis of anything like the present average consumption of gas per consumer. In Yorkshire he had made an investigation, and he found there were a number of small undertakings, it would astonish them to know how many, with a consumption of under 12,000 c.ft. per consumer. He had experimented in the hot water field, and his Directors authorized an effort on extraordinary low terms. They fixed 20-gallon apparatus for unlimited use for 3d. per day, or £4 10s. per annum; and in a number of cases they got permission to fix meters, being careful to tell the customer not to take any notice of it as it would make no difference to him. He found that the average consumption was between 50,000 and 55,000 c.ft. per annum. In the face of that, were they going to continue to look at the hot water business as something which was going to remain on a small scale or as potential business which would treble the gas consumption? Were they looking forward to the day when gas water heaters would be as common as gas cookers were to-day? He urged the necessity of a co-ordinated policy so that the State and municipal authorities might feel they were dealing with the Gas Industry and not with small local gas undertakings which had different prices and different business policies.

When he first went out to sell gas it was futile to make the luxury appeal; one had to make the economic appeal. The average man did not consider it was his duty to reduce the domestic work which his wife had to do. Broadly speaking, the wife also took that view, so that it was impossible to sell gas appliances on the luxury basis. What was the position to-day? The man was standing off from his beer so that his wife might have cigarettes. They had reached an age to-day when it was not only not necessary to make the economic appeal, but when they must make the luxury appeal; and the whole of their publicity wanted to be re-orientated to that end. And while they were talking about competing with electricity and coke they must also remember they were also competing with the cinema and the silk stocking. The real essential to-day was the luxury. People started with what they wanted for the cinema and cigarettes and then came back to food.

He pointed out that owing to the changes which had taken place in the last few years they must face the fact they had not an appreciable economic superiority over electricity with the latter at ½d. per unit and gas at 7½d. per therm. There were many places where gas was in a definite position of inferiority. They had to find some other method of selling gas and prove it superior in service in some way, or find means of making gas in such quantity and for every purpose at a price which would restore the economic superiority of gas price for price on the thermal basis.

If they were going to develop the summer use of gas and the winter use of coke in connection with hot water, he believed they would be overwhelmed; they would not even the demand, but would have mountains of coke. He believed the field they ought to exploit for coke was the domestic grate, and that they should go for the hot water supply of the house solely with gas and put gas in competition with electricity for every purpose. He would say that the B.C.G.A. should regard gas as its pigeon and leave the coke sales to another appropriate body, because in Yorkshire and other parts of the country it did not mean that he got the business: he did not supply the military or the municipality with a ton of coke, and they were the largest potential users. Therefore he did not wish money of the B.C.G.A. to be used for the purpose of advertising coke.

A GOOD COKE MARKET MEANS CHEAP GAS.

Dr. E. W. SMITH said if they were to sell gas in much bigger quantities they must increase the value of coke, which pre-

supposed a market for it. That market took two forms, one was the domestic market, and to meet that they might have in the future to sacrifice to some extent the gaseous yield they obtained for the open fire, and the other market was for central heating and hot water supply. The chief difference he had with Mr. Bloor was that he looked on the Gas Industry purely as a Gas Industry. That was a point of view, but if they carried that to its logical conclusion it would simply have the effect of putting up the price of gas. Logically, they should not wash for benzole, where it paid to-day, and so on. In so far as the value of coke could be increased, the price of gas would be reduced. A big step had been taken by the London and Counties Coke Association in developing the quality of coke; and he would like to see engineers develop intensive practical research into the application of coke to central heating and for other purposes. It was not sufficient to leave this to the London Committee, however good the work might be.

Mr. G. M. Lewis (Birmingham) said he thought perhaps up to now they had been experimenting with water heating in view of the great number of changes which had taken place in the last two or three years. He was not sure they were on the right lines in regard to small-capacity storage heaters. The 20-gallon size was enough for a small house, but it was not enough for a family; and he would suggest they should push as much as possible the larger sizes of storage heaters. Water heating to-day, they could tell the public, was absolutely safe if the proper appliances were used for hard or soft water, and he thought they could claim that the appliances would require considerably less maintenance and be less trouble to the user than any other type of hard fuel boiler. He would like to stress the importance of an undertaking adopting a good maintenance system for all the water heating apparatus in their district.

Mr. W. H. Becket (Gas Light and Coke Company) said that in London they viewed coke as being complementary to gas, and he drew attention to the campaign on water heating which they were launching in about a fortnight's time. They wanted to bring home to the people what they were going to call the ideal combination, coke for the winter load and gas for the summer load. They hoped materially to improve their hot water load and at the same time to improve their gas load generally.

Written Contribution.

Mr. T. F. C. Potterton writes: Everyone will be impressed with the excellence of this paper, inasmuch as it enumerates sound practice for gas undertakings to follow in this important branch of their work, but the factor that I consider of foremost importance is the training of salesmen and other members of the staff who are associated with salesmanship. In this respect representatives who interview consumers should be acquainted with the salient points relating to the use of alternative fuels—viz., coke, oil, and electricity—in order to put forward the advantages of gas and qualify their arguments by statements as to the relative costs of the different classes of fuel and their application.

Another matter of the greatest importance is the maintenance of gas appliances to ensure the continuance of good service with efficiency. For this duty it is essential for the staff employed to be fully acquainted with the design of the appliances, their capacity, and consumption. We are often told by a consumer that the man who cleaned the heater said it burnt gas at the rate of one shilling per hour, when the true figure should have been threepence or less. Such misrepresentations can cause a great deal of harm, for it is surprising how readily the public in general accept a statement of this nature, and repeat it.

Apart from this, the training of the staff in the technical knowledge of hot water circulating systems and heating apparatus is likewise essential. It is generally considered that about 80% of the existing solid fuel fired installations in London are so badly designed that without some modification, or even reconstruction, the application of a gas water heater should not be entertained. In such cases it is necessary for the salesman to be able to explain what is wrong with the system, and how it can be improved, in order that a gas water heating unit can be successfully installed.

The cost of gas for water heating is a matter that is uppermost in the minds of any prospective consumer, and unless the salesman is able to quote approximate figures upon the running cost of any proposed installation, it is unlikely that headway in sales will be effected.

This is considered one of the factors bearing upon the comparatively small use of water heating appliances in some districts, to which comment is made in the opening paragraph of the paper.

The consumer should be advised upon the economical use of the system, as the human element has so important a bearing upon the running cost. Wastage of water is often a responsible factor, and can be prevented to a considerable extent by the adoption of self-closing non-concussion spring taps, especially in blocks of offices and public buildings.

Heat losses by radiation should always receive particular attention, and it is often found that unnecessary lengths of secondary circulation are used, when, even though the pipework is well insulated, a proportion of the heat must be dissipated. A "night-valve" to control a secondary circulation has proved to be of the greatest use in reducing such wastage.

Under the heading of "Types of Demand" a useful comparison has been made. Our experience is that in many cases, such as sports pavilions and many public buildings, peak demand periods occur which require an immediate discharge of a large quantity of water at a number of points, and it is in this connection that "storage capacity" rather than "boiler output" counts, there generally being long periods between the demand.

In such cases a large storage of water, equal to the full demand, should be provided, having boiler power proportionate to the heating-up period available. The installation, of course, needs to be thoroughly lagged.

The practice of combining domestic hot water supply and central heating, where gas is used for the dual purpose, is one that needs careful consideration. It is frequently found that while a comparatively low temperature is sufficient for the heating section of the apparatus during mild winter weather, for domestic use it is necessary at all times to maintain a water temperature of not less than 140° F., as water below this degree is not satisfactory for culinary purposes.

For this reason the provision of separate units is favoured, as the varying conditions are then more easily met, and, furthermore, better stratification is obtainable in the storage than with a calorifier or indirect cylinder on a dual system.

The paper as a whole is so comprehensive that one can refer but briefly to a few of the items, many of which are of sufficient importance to be treated individually, and I am sure those members of gas undertakings concerned with the distribution side, as well as the Industry in general, will be glad to profit by the information given in this valuable contribution.

Heating in the Future.

In a paper before the Royal Society of Arts on "Recent Developments in the Heating and Ventilation of Buildings," Mr. J. L. Musgrave, Past-President of the Institution of Heating and Ventilating Engineers, said that recognition of the necessity for sunlight will probably at some not too distant date lead to the prohibition of the emission in any form of the products of combustion within the boundaries of cities. Factories and large buildings will install means for dealing with the smoke and deleterious gases which vitiate the atmosphere; and such prohibition might, in all probability, lead to extensive "district heating," a system in which heat is generated at a central source and distributed through mains under the streets, from which branches are taken to the buildings *en route*.

Rarely has this system proved entirely satisfactory, owing to the enormous overhead cost of installation and the loss of heat during transmission through the mains.

In a comparatively mild climate such as this, where the demand for heat would reach the peak only on a few days each year, the percentage of overhead costs would be higher than in cold countries. The gas and electricity supply authorities may be looked to to assist in the solution of this problem.

Gas is a fuel which could be used with advantage for heating buildings, and there are many ingenious methods of application, including, among others, the automatic Potterton boiler and the Vesta boiler suited for larger installations.

In conjunction with thermal storage, gas could be usefully and economically employed if those responsible for the supply of gas would adopt a system of flexible tariffs, so that gas taken at slack periods, which would lead to no increased demand upon the mains and plant, could be supplied at a reduced rate. In a few provincial towns this is done, but in most districts of London, electricity to the consumer is a less expensive means of heating than gas.

The increasing use of heat non-conductors in the construction of buildings, and the improvement in means of thermostatic control, have reduced considerably the heat consumption needed to maintain conditions of comfort. These, in conjunction with the economies known to be associated with low-temperature radiant heating from ceilings, indicate that a combination of all the above would bring the use of electricity within the realm of practical politics.

School Heating by Electricity.

Charge of 15s. per Head.

A statement as to the cost of heating and lighting the new Bailey Council School at Fleetwood, submitted to the Urban Council sitting in Committee, showed that £750 was the sum incurred for electricity. This is an average of 15s. per scholar, compared with 5s. for heating and lighting other local schools by ordinary means.

It was suggested that there had been a lack of care in the use of radiators, and that the opening of windows during the winter period might have induced greater use of electricity than would otherwise have been necessary.

The Council decided to make some reduction in the charge per unit.

GAS AT THE SOUTH LONDON EXHIBITION

South Metropolitan and South Suburban Companies Co-operate in an Effective Display at the Crystal Palace

" Bigger and Better " year by year is not only the aim and object, but definitely the achievement, of the organizers of the South London Gas Exhibit, whose display is one of the finest in the third annual South London Exhibition being held at the Crystal Palace from March 8 to 18. The advent for the first time of electricity to the Exhibition is accompanied by a gas display, which, good as the previous displays undoubtedly were, far surpasses former efforts.

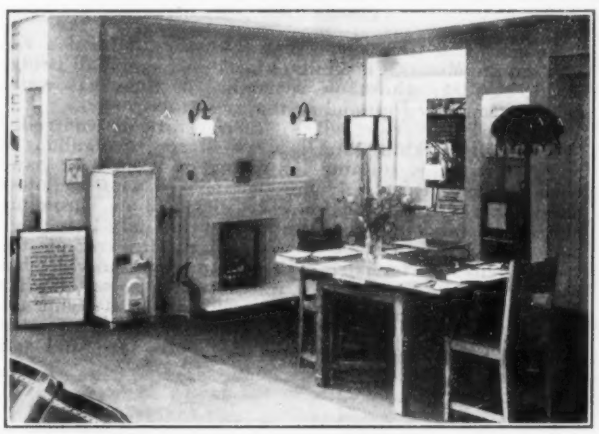
The stand, which, in addition to being the most striking in the Exhibition, is probably one of the largest, was executed throughout in plaster and erected by the South Suburban Gas Company to the design of the South Metropolitan Company's Architect, Mr. Prior, and, rectangular in shape, it is " stepped " down from one end to the other in the form of a miniature theatre which seats 120 persons. In this theatre the public watch the cookery demonstrations carried on practically continuously on the stage at the lower end, every member of the audience thus being enabled to obtain a perfect view of the proceedings, while the Lady Demonstrator's remarks are amplified by loud-speakers, which render her quite audible in all parts of the stand. During the short intervals between the cookery demonstrations, lightning sketches, both amusing and practical, relating to gas subjects, are carried out dexterously in crayons by a demonstration artist.

Effective Lighting.

The lighting of the stand is particularly effective, being carried out on the indirect principle round the four walls, with floodlighting at night concentrated on the interior of the stand, thus throwing into relief all that is to be seen within. This is certainly a very practical method of floodlighting and has much to recommend it in comparison with the perhaps more usual method of floodlighting the outside structure of the stand. In any case, the results are definitely attractive.

A wide range of gas appliances are arranged round the walls of the stand, both inside and out, while the upper end behind the seats is covered over and forms an information bureau, illuminated by indirect lighting. Two attractive fireplace settings are situated in this section, one of these being the " Metro " inset grate, with chromium plated reflector and knobs, bronze pilasters and fender—a fire suitable for fixing on a hearth or on the bottom grate of almost any slow-combustion fireplace. Coloured finishes are the order of the day for almost every appliance on the stand, an extensive variety of pleasing " Sunsheen " shades being displayed.

The " Lumetro " gas fire is worthy of note, being an attractive representation of a glowing solid-fuel fire, with flames flickering through a sparkling incandescent fuel bed which is composed of small irregularly-shaped pieces of fuel arranged in a firebrick setting. The fire is fitted with two gas burners controlled by a combination cock. Gas is first supplied to the bunsen burner, heating the firebrick and fuel to a state of incandescence, the radiation emitted producing warmth in the same way as any other modern gas fire with high radiation efficiency. When the fuel bed is thoroughly incandescent, gas can be supplied to the luminous burner by the simple action of advancing the key of the combination cock. The gas then ignites and burns brightly through and over the fuel bed. The bunsen burner is stated to consume, in the case of the 6-burner fire, one-sixth of a therm per hour, and the luminous burner a maximum of one-thirtieth of a therm per hour, at a pressure of 25/10ths water gauge. There is a slight loss of overall efficiency when the luminous burner is turned on, but this is more than compensated for by the lively appearance of the fire and the improved quality of the radiation. The



fire measures 23 in. high by 19 in. wide and 7½ in. deep, with a height to the top of the flue of 19⅜ in.

Two New Flueless Heaters.

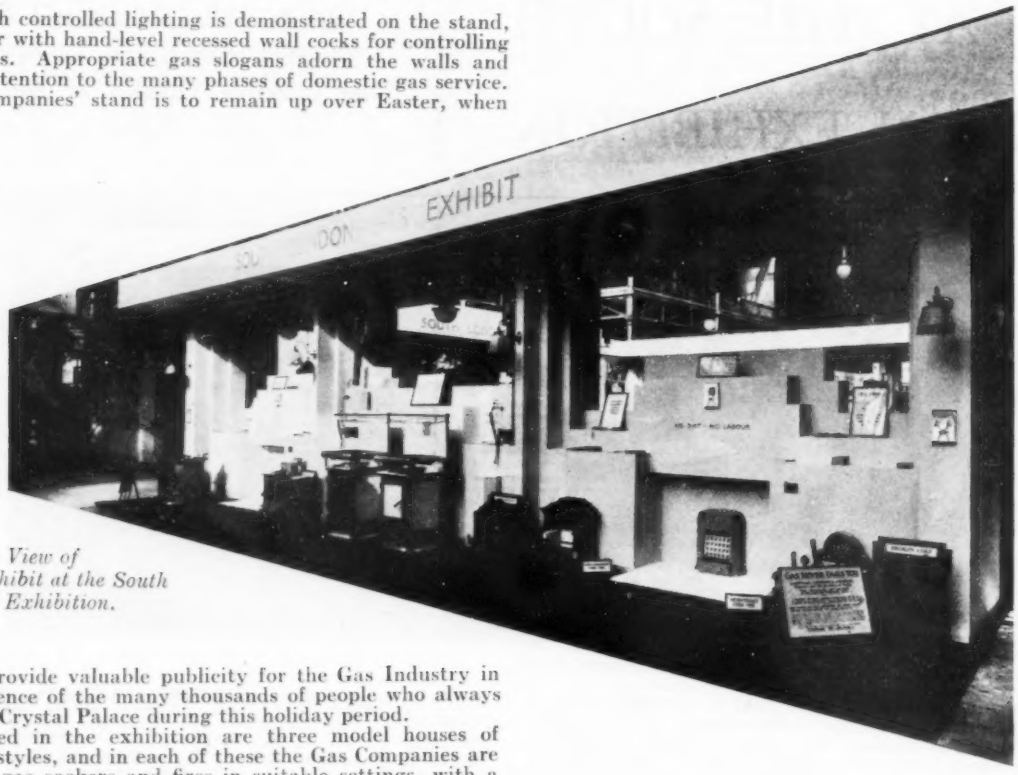
Particular mention must be made of two attractive flueless heaters shown on the stand, which have only recently come on the market, and whose general appearance and efficiency render them valuable additions to the already wide range of gas heating appliances.

The " Metro " panel heater is a very pleasing apparatus in a green finish with a black high-temperature panel in the front and red frosted glass before the five pierced steatite burners, which consume about 8 c.ft. of gas per hour. A high degree of warmth is emitted from the panel and from the exhaust air ports, which are situated on either side about half way up. The apparatus is designed variously to stand on the ground, on feet, or be affixed to brackets on the wall.

Also very attractive is the Parkinson " Cabinette " heater in old gold finish, which works at a lower temperature, but is none the less efficient. The pleasing design of this

appliance would certainly enhance any interior decoration scheme.

Switch controlled lighting is demonstrated on the stand, together with hand-level recessed wall cocks for controlling gas fires. Appropriate gas slogans adorn the walls and draw attention to the many phases of domestic gas service. The Companies' stand is to remain up over Easter, when



Further View of Gas Exhibit at the South London Exhibition.

it will provide valuable publicity for the Gas Industry in the presence of the many thousands of people who always visit the Crystal Palace during this holiday period.

Included in the exhibition are three model houses of varying styles, and in each of these the Gas Companies are showing gas cookers and fires in suitable settings, with a view to demonstrating the important part gas can play in the running of the small modern house. One of these houses is floodlighted at night by Sugg's 10 and 6 burner floodlighting units placed in the corners of the beautifully laid out model garden surrounding the building, the units being skilfully hidden in the foliage so as to be almost unnoticeable. The public's attention is nevertheless directed to the fact that the floodlighting is carried out by gas.

Further Exhibitors.

Among other firms displaying at the South London Exhibition are Messrs. Clarkhills, Ltd., of 31, Vauxhall Bridge Road, S.W. 1, who show a number of their gas water heaters, connected up and in working order.

The Clarkhill "Vauxhall" is thermostatically-controlled—as are all Clarkhill water heaters—storing two gallons of hot water. It is suitable for fitting over sinks or hand basins and is attractively finished in hard white cellulose paint, the fittings being heavily nickelled or chromium plated. It takes up very little room, being only 16 in. high and 9 in. in diameter. An important feature of the "Vauxhall" heater is the special tap which provides hot water from the heater, cold water (which is suitable for drinking if required), or a mixture of both, thus saving the cost of any taps. The inner cylinder is made of stout tinned copper, a finish suitable for both hard and soft water.

The Clarkhill "Standard" water heater is a strong machine made entirely of copper and brass, specially designed for easy maintenance, being recommended for situations where the points to be served are far from the machine, or where more than three hot taps are required. It is made in four different sizes, varying from 3 gallons to 5½ gallons per minute. The outside of the heater is finished in oxydized copper with nickel plated valves, but it can also be obtained all chromium plated or with a light cream enamelled body and chromium plated valves, or in any other colour to suit individual decorative schemes.

Another popular Clarkhill model is the "Minor," which has an output of 3 gallons of water per minute raised to 40° F., or a correspondingly smaller flow with a higher rise in temperature.

Messrs. Halliday Boilers, Ltd., of Saxon Road, S.E. 25, are showing examples of their gas boilers, which are supplied in a variety of attractive finishes produced by the "Foochow" process by Messrs. Donald Macpherson & Co., Ltd.

Also shown on this stand is the "Corinth" luminous radiator, which has been designed to provide heat and light. By using an incandescent mantle on a burner of 60 c.p., light is obtained for illuminating halls and corridors, at the same time providing sufficient heat to produce a comfortable temperature.

THE "JOURNAL" TECHNICAL RECORD

Which contains Reports of Meetings of Gas and Allied Associations

Midland Association of Gas Engineers & Managers

Presidential Address of Mr. T. H. Poulson, of Stafford

On Thursday last the Annual General Meeting of the Association took place in the Grand Hotel, Birmingham; the chair at the outset of the proceedings being occupied by Mr. E. B. Tomlinson, of Birmingham, the outgoing President, and subsequently by the new President, Mr. T. H. POULSON, Engineer, Manager, and Secretary of the Stafford Corporation Gas Department.

The minutes of the last meeting having been read by the Hon. Secretary (Mr. S. J. Sadler, of Solihull), a hearty welcome was extended to Councillor Owen, Chairman of the Stafford Corporation Gas Committee, to Mr. George Dixon, of Nottingham, the President of the Manchester Association of Gas Engineers; and to Mr. A. C. Hovey, the President of the North of England Gas Managers' Association. These gentlemen expressed their pleasure at being present.

The adoption of the annual report and accounts was moved by the PRESIDENT, who remarked that there was little in them to which there was any special need to refer. It was very gratifying to note the large number of students who attended the meeting last October to receive certificates in the Higher Grade Gas Examinations. They must all realize the significance of these juniors showing the interest they did in the work of the Industry.

Mr. C. M. D. BELTON (Shrewsbury) seconded the motion, which was unanimously agreed to.

Mr. F. C. BRIGGS (Dudley), the Chairman, next presented the report of the Midland Commercial Gas Association, and in doing so paid a sincere tribute to the value of the work of the Hon. Secretary, Mr. R. S. Ramsden, of Leamington. The average attendance at the meetings, he said, showed a substantial increase. Matters in which all were interested had been discussed in the ordinary way, and in addition to these they had made a new departure in that they had one special subject chosen for discussion at each meeting—something of real commercial value. This innovation had been much appreciated, and it had been agreed that a full report of one discussion should be included in the Association's annual report. Those who received this report would get 10s. 6d. worth value from that alone. They had been discussing the question of coke with other Associations; and although they had not been able to arrive at a definite scheme, they felt that they had acted as a "League of Nations" in exercising moral suasion, and so had accomplished a certain amount of good. A case of "invasion" into one area had been definitely stopped. He was not going to appeal for a bigger membership, but those who were not in the Commercial Association just did not know what they were missing. To the younger engineers he would say that the information gleaned was invaluable; while the older members would find the new ideas arising out of these discussions very valuable.

While moving the adoption of this report, Mr. Briggs said he would take the opportunity of submitting also the report of the Midland District Education Committee, of which he is also Chairman. This Committee continued to function, but its duties now were very light, because with the revision of the rules the work had become more automatic. It was, however, invaluable to those who wished to take the examinations, and it was very much appreciated. He would, therefore, ask those members who were appointed to that Committee to do their utmost to attend the few meetings which were now held.

The PRESIDENT, seconding the adoption of the reports, remarked that they were very grateful to Mr. Briggs for the enthusiasm and the energy he put into all the work he did for these organizations.

The resolution was carried unanimously.

Mr. Poulson was appointed representative of the Association on the Council of the Institution of Gas Engineers, and the following were elected to represent the Association on the Midland District Education Committee: Messrs. T. H. Poulson, R. S. Ramsden, F. C. Briggs, and W. G. S. Cranmer.

NEW MEMBERS.

The following additions were made to the membership roll:

Mr. Geo. Dixon, Nottingham.
Mr. R. H. McGregor, Coalville.
Mr. G. P. Mitchell, Worcester.

ALTERATION OF RULES.

The following alterations to Rules 1, 2, and 13 were then submitted.

1.—That this Association shall consist of Members and Honorary Members.

(1) Members.—Every candidate at the time of his application for election shall be:

(*a*) An Engineer or Manager of a Gas Undertaking;

or, (*b*) A Deputy Engineer or Superintendent in Charge of a Gas-Works making not less than 500 million c.ft. of gas per annum;

or, (*c*) A person qualified in the opinion of the Committee to assist in promoting the objects of the Association by reason of his professional knowledge or experience, and who shall not be engaged with any trading or manufacturing firm, except where such applicant for Membership has already been accepted a Member of the Institution of Gas Engineers.

(2) Honorary Members.—A person who has formerly qualified as a Member, but who has retired from active management.

The election to be at the discretion of the Committee, and subject to confirmation at the next General Meeting of the Members.

2.—That the affairs of the Association shall be managed by a Committee, which shall consist of a President, Vice-President, four immediate Past-Presidents, Hon. Treasurer, Hon. Secretary, and nine Members, any four of the foregoing to form a quorum. The Presidents and Honorary Secretaries, for the time being, of the Midland Commercial and Midland Junior Gas Associations to be *ex-officio* members of the Committee.

13.—The Annual Subscriptions to be paid by each Member having control of a works making under 50 million c.ft. of gas per year shall be 15s., and for all other Members £1 5s., payable in advance on the 1st of January each year, 2s. 6d. of the subscription to be credited to the Emergency Fund.

The PRESIDENT said, with regard to Rule 1, that many of the other District Associations had been admitting candidates who had been elected members of the Institution of Gas Engineers, and their own Association were losing one or two members owing to the fact that they were engaged in business. This was the main reason of the alteration, but it had also given an opportunity of making the Rules a little clearer. As to Rule 2, they desired to enjoy the privilege of electing the President and Hon. Secretary for the time being of the Midland Commercial Gas Association, in addition to the President and Hon. Secretary of the Midland Junior Gas Association, to be *ex-officio* members of the Committee. The only modification to Rule 13 was to increase the subscription of members of the Association who had an annual make of 50 million c.ft. of gas and over. It was not proposed to increase the subscription of those whose make was under 50 millions. The Association were unfortunately running away with their balance, and it must be remembered that, for the subscription, the members had a book valued at 10s. 6d., and that out of the remainder 2s. 6d. went to the Emergency Fund. There was also payment to be made for the rooms they used for meetings, postages, and other expenses. No doubt the Committee

would be only too pleased to consider a further revision of the subscription rates when the balance available might allow of it. It was proposed that the increase indicated should start from last January. The modifications had been drawn up and submitted strictly in accordance with the rules.

Mr. BRIGGS questioned whether it was wise to state definitely in the Rules that 2s. 6d. of the subscription was to be credited to the Emergency Fund. They should take into account the size of the fund, and the smallness of the demands made upon it.

The PRESIDENT replied that this point had been debated. As a matter of fact, they had been extraordinarily fortunate in the demands made upon the fund.

It was realized that the fund had been growing, but even so it had not been felt desirable to make any alteration in the arrangements.

On being put to the meeting, the alterations in the Rules were unanimously agreed to.

THE NEW PRESIDENT.

The PRESIDENT, asking Mr. Poulson to take the chair as President for the coming twelve months, said he had known him for many years, and recalled the Presidential Address on piling which he had delivered to the Midland Junior Gas Association in 1918. That address had been referred to

THE PRESIDENT,

T. H. POULSON, Stafford.

Mr. Poulson received his mechanical training in the workshops of Messrs. W. G. Bagnall, Ltd., Locomotive Engineers, Stafford, and his training as a Gas Engineer at the Stafford Corporation Gas Department under Mr. Hubert Pooley. Mr. Poulson was appointed Assistant Manager to the Cannock, Hednesford, and District Gas Company, and later as Technical Assistant to the Nelson Corporation Gas Department. In 1914—on the death of his father, who had been Works Superintendent for 29 years—Mr. Poulson returned to Stafford to succeed him in that position, and was appointed Engineer and Manager of the Undertaking in 1921. Mr. Poulson is an Associate Member of the Institution of Mechanical Engineers and a Fellow of the Chemical Society.

on many occasions since. As Gas Engineer at Stafford, Mr. Poulson occupied a very important office. He had increased the number of his consumers in the last six years by over one-sixth, which was very gratifying. They had in him a man who had always done his utmost for the Industry generally, as well as for his own Corporation; and he was invariably willing to help others.

Mr. POULSON was received with applause when he took the chair and offered the thanks of the Association to Mr. Tomlinson for the excellent manner in which he had carried out the duties of President during his year of office. Mr. Tomlinson combined with his great ability as a gas engineer, a remarkable willingness to assist others, and especially the junior members of the profession. Mr. Tomlinson was, indeed, a man of sterling worth, and those who knew him had learned to love him. On behalf of the members, it was his pleasure to hand to Mr. Tomlinson the Past-President's Medal, as a memento of his year of office; and he hoped he might be spared for many years to wear it.

Mr. TOMLINSON, returning thanks, said it had been a great pleasure to become more closely associated with the members of the Association. He had much enjoyed his year of office, throughout which he had received unstinted kindness.

PRESIDENTIAL ADDRESS

By T. H. POULSON, Stafford.

I greatly appreciate the honour of being elected President of this important Association, the high traditions of which it will be my earnest endeavour to maintain. I assure you I shall also do my utmost to discharge the duties of my Office in a manner worthy of the great trust that has been reposed in me.

In this address I propose, first of all, to refer to certain parts of the gas-works with which I am connected. No doubt some of the difficulties presented by the particular site are unique, but it is thought that the measures taken to deal with them may prove of general interest.

Stafford Gas-Works is bounded for a distance of 175 yards on the west by the River Sowe. No doubt this river has shifted its bed several times, and until comparatively recently it was fringed by a considerable area of low-lying, swampy marsh land.

The sub-soil consists of water-logged clay, fine black sand, peat, gravel, and running sand and clay, all in varying thicknesses. It will be thus realized that the ground is far from being ideal for supporting the heavy plant required in a modern gas-works.

In a test hole made on the site of the vertical retort installation the strata were as follows:

	Ft.	In.
Filling material	6	6
Water-logged clay	2	3
Fine black sand	1	9
Peat	1	6
Gravel	1	9
Running sand	12	0
Total	25	9

In this instance, water was found at a depth of 7 ft. below ground level. In other portions of the works, and after heavy rain, water may be found at a depth of 3 ft.

Tests made for the purpose of ascertaining the weight-carrying capacity of the ground on another portion of the works showed that:

(1) At a depth of 8 ft., with a load of 1 ton per sq. ft., a subsidence of $1\frac{3}{4}$ in. occurred in three days.
(2) At 4 ft., with a load of 10 cwt. per sq. ft., a subsidence of $\frac{3}{8}$ in. occurred in the same period.
(3) At 2 ft., with a load of 10 cwt. per sq. ft., no subsidence occurred in five days.

It will be realized, therefore, that the filling-in material will carry a greater load than the virgin soil, and that the safe load on the filling-in material is only a few hundredweights per sq. ft.

Conditions for obtaining reliable foundations are adversely affected by the varying heights of the adjoining river, which, after heavy rain, rises several feet above normal, water-logging the foundations and disturbing the nature and position of the sub-soil. While the flood is subsiding the sub-soil is drawn from the foundations by the water towards, and into, the river. Consequently, most of the buildings lean towards the river.

The following will illustrate the damage caused by subsidence:

Thirty-five years ago the guide-framing of a 170,000 c.ft. gasholder was converted to Pease's wire rope system of guiding, because the former framing often became defective through the subsidence of the brick tank. Twenty years later, the tank became oval in shape, causing the concrete coping to tear the sheeting of the outer lift quite extensively in two places. As satisfactory repairs could not be effected without considerable outlay the holder was abandoned.

Eleven years ago, the whole of the old purifying installation, consisting of ten purifiers, had to be disbanded, as subsidence had caused the bottom plates to crack badly. Needless to say, the new purifiers were erected on a better site.

In November last, an 18-in. underground by-pass valve cracked across the body. A new valve was obtained and fixed immediately, and the threatened interference with the gas supply was averted.

In an endeavour to prevent subsidence, the driving of piles has been resorted to, in fact the works has been built on piles of various types.

In the older portion, pitch pine piles were used. Some of these were 10 in. and others 12 in. square, the length vary-

ing from 26 to over 50 ft. In the newer portions, pre-cast reinforced concrete piles were used; these were 12 in. square, and from 26 to 37 ft. in length. Stewarts " cast in place " concrete piles were also used; these were 16 in. in diameter and from 42 to 55 ft. in length. In this system a steel tube, having in this case an internal diameter of 14 in. and fitted with loose pointed shoe, is driven into the ground to refusal point. The tube is then filled with concrete, and withdrawn immediately, leaving behind in the ground a column of concrete which constitutes the pile. All these piles having been driven, the tops are braced together by beams made of the same material as the piles. From these beams, the ordinary foundation work is commenced.

Little or no subsidence has been observed in structures erected on piles subjected to the following load per pile:

Pitch pine, 12 in. square, length 53 ft	6 tons
Pre-cast reinforced concrete, 12 in. square, length 37 ft.	37 ,,
Stewarts tube system, 16 in. diameter, length 55 ft.	33 ,,

It may be of interest to record that sixty pre-cast reinforced concrete piles were used in the foundation of four settings of Glover-West vertical retorts; six for the coke storage bunkers; and a further six for the future extension of coke plant. The approximate cost of 12 in. square pre-cast reinforced concrete piles was 12s. per foot; the cost of driving was 4s. per foot.

It is beyond the scope of this address to give further details of pile foundations, a subject which I have found to be full of absorbing interest.

In passing, it may be of interest to mention that apparatus can be obtained by means of which a sample of the sub-soil may be taken from the ground at any predetermined depth up to 400 ft.

Reconstruction of Vertical Retort Installation.

The Glover-West vertical retort installation was put into operation in the year 1919. It consisted of four settings of eight retorts, each 33 in. by 10 in. by 21 ft. long. The productive capacity was 1,200,000 c.ft. per day.

By 1923 one setting of retorts became due for renewal. About this time the new steaming chamber—or " bell bottom " type of retort—had been brought into operation elsewhere, and as our output of gas was increasing, the question arose whether to re-set or to reconstruct to the newer type. Reconstruction was decided upon, for thereby a greater thermal yield per ton of coal would be obtained and the capacity of the settings would be increased from 1,200,000 to 2,000,000 c.ft. of gas per day.

The reconstruction had to be carried out gradually, and was spread over a period of three years, owing to other carbonizing plant not being available.

Retorts 33 in. by 10 in. by 25 ft. long were installed, necesitating the raising of overhead coal hoppers, platforms, offtake mains, &c., a distance of 4 ft.

When the second setting was demolished prior to reconstruction in 1924, the space provided an opportunity for lifting a horizontal waste-heat boiler to the height of the charging platform, and lowering two small vertical waste-heat boilers which were being dispensed with.

The following year the remaining two settings were demolished, another waste-heat boiler installed, and the settings rebuilt.

The estimated cost of renewing the existing small retorts was		£5,600
The costs of reconstruction were:		
Four settings of retorts	£16,000	
One additional retort house governor	350	
		£16,350

It will thus be seen that at a cost of £10,750 over the cost of renewing, our carbonizing plant was made capable of producing an additional 800,000 c.ft. of gas per day.

It was foreseen that the existing retort house governor would not be large enough to pass the extra quantity of gas that would be produced; therefore an additional governor, with offtake, was fixed at the far end of the foul main. The foul main was cut and a valve inserted, thus enabling the gas from two settings to be taken through either governor.

Waste-Heat Boilers.

The cost of the two waste-heat boilers, with pumps, flues, &c., was £4239. These were of the fire-tube type, 18 ft. long by 5 ft. diameter, each having an evaporative capacity of 2500 lbs. of steam per hour from and at 212° F.

These boilers are worked for three months alternately, and, up to the present time, no trouble has been experienced with the tubes.

The tubes of one of the superheaters were examined recently, the Insurance Company reporting as follows:

> " Odd tubes were slightly indented under hammer test. One of these was withdrawn and cut up. The general thickness is 9 I.S.W.G., with one place in U bend at 10. The original thickness was 8 I.S.W.G."

Since the larger boilers have been installed a saving of £1100 per annum has been effected in the cost of steam-raising.

Coal Elevating Apparatus.

After fourteen years continuous daily use—during which time 250,000 tons of coal have been handled and no breakdown has occurred—the 25-ton per hour gravity bucket elevator conveyor is now being replaced. It is a tribute to the excellence of British materials and craftsmanship that the period of usefulness of this conveyor has extended so long. The amount spent on repairs has been negligible, in spite of the fact that the major portion is always exposed to the weather.

The replacement conveyor, which is being fitted with an automatic forced lubrication apparatus and hardened steel bushes instead of cast-malleable ones, will, I believe, have even longer life.

Coke Elevating and Screening Plant.

This plant was erected thirteen years ago. The octagonal rotating screen, made of ⅝-in. mild-steel perforated plates, was renewed after screening—more or less efficiently—47,000 tons of coke.

This screen has now been replaced by one of the reciprocating type, and while it is at present too early to judge the wearing qualities, better screening is being obtained with much less breakage of coke and power-consumption.

Ammoniacal Liquor Disposal.

For upwards of two years a little more than one-third of our ammoniacal liquor has been destroyed by evaporation on the bars of the producer step grates of the vertical retorts. Some 30 gallons per hour is supplied to each producer—15 gallons is evaporated, while the surplus is collected in a tank fixed below ground level, from which it is pumped again to the overhead feed tank.

The crude liquor contains about 1% free and 0·5% fixed ammonia, while its O/A value is 1500 to 1600 parts per 100,000.

The liquor which has been over the grate bars contains about 0·5% free and rather more than 1% of fixed ammonia, a small quantity of phenol, and a trace of ammonium sulphide. The O/A figure is increased to 1600 to 1700 parts per 100,000.

The destruction of the liquor in this manner has resulted in decreasing the make of sulphate of ammonia from 224 tons to 103 tons per annum.

Extract from Analysis of Accounts.

Having described the reconstruction and the component parts of the vertical retort installation, it may be fitting to include an extract from the Analysis of the Accounts for the year ended March 31, 1932:

Coal carbonized	17 299 tons
Coal gas made	334,838,000 c.ft
C.W.G. made	*Nil*
Declared calorific value	440 B.Th.U. per c.ft.
Per ton of coal—	
Gas made	19 934 c.ft = 87·7 therms
Gas sold	18,491 c.ft. = 81·3 therms
Coke sold	7·72 cwt.
Tar made	19·72 gallons
Ammonium sulphate	13·29 lbs.
Net proceeds of residuals on cost of coal	46·2%

The coals carbonized have generally been Midland coals giving a comparatively low yield of coke per ton but working fairly rapidly through the retorts.

De-greasing Plant.

For cooker reconditioning we have installed a trichlorethylene de-greaser. Cooker parts are now given a bath in trichlorethylene vapour. The grease is dissolved in the vapour and collected in the base of the apparatus. Our employees find that this is a more cleanly and far less disagreeable process than the old method of steeping the parts in caustic soda solution. I must, however, mention that in the case of enamelled lining plates, on which grease is often hard or semi-carbonized, the trichlorethylene method is not very successful, and so, for these, the caustic soda method has still to be employed.

Essentially, the de-greaser consists of a galvanized sheet-steel tank which contains in its base a few gallons of trichlorethylene in which is immersed a steam coil. The cooker parts are placed in a wire container in the apparatus, and steam at low pressure is then applied. The steam causes the resulting vapour—which is heavier than air—to fill the tank to just above the top of the cooker parts. At this level water-cooling coils placed round the inside of the tank prevent the vapour from rising and overflowing.

The apparatus has a total capacity of 40·5 c.ft., and

occupies a floor space of 11½ sq. ft. It replaces four caustic soda tanks which formerly occupied a floor space of 32 sq. ft.

It is found that in eight hours the plant will deal with twice the number of cookers as were dealt with by the caustic soda tanks, when the immersion period was 24 hours. The apparatus takes two sets of cooker parts, which are de-greased in 35 to 40 minutes, and washed immediately afterwards in the ever-ready hot water supplied by the cooling coils.

The labour cost for dismantling, cleaning, and reassembling the cookers is, of course, about the same as with the caustic soda process. The cost of trichlorethylene is about 10d. per cooker against 3¼d. for caustic soda.

Coke Sales.

I consider that the highly important and unstable coke market calls for far greater attention from the Gas Industry than it generally receives. I call it unstable because we all experience times of excessive and short stocks. Highly important it certainly is because approximately 8 million tons of coke are available for sale annually from the various gas-works in the United Kingdom, while the demand is capable of being increased to an even greater figure.

The competition from oven coke is becoming keener year by year. It must be admitted that the producers of furnace coke have enormous advantages so far as transport charges are concerned, and this advantage is being pressed to the uttermost in certain districts.

In a paper presented by Mr. R. A. Mott, M.Sc., F.I.C., to the Midland Section of the Coke Oven Managers' Association at Sheffield on Oct. 14 last, it was stated that "the amount of oven coke produced annually was 13 million tons. The amount used for domestic purposes, after starting from negligible amounts before the war, rose during the war to considerable proportions, and had increased since then, until now it accounted for something like 2 million tons per annum—a most encouraging figure."

This surely strikes a note of warning.

The producers of oven coke, in the hope of securing a larger proportion of the sales effected, are exploring every avenue whereby their product may be improved. Are we, of the Gas Industry, doing likewise? Are we fostering the goodwill of our customers by studying their needs? Are we making a dustless product of suitable size—with a low water and ash content? Are we giving delivery at the most convenient time and in a manner suitable to individual requirements? Also, are we endeavouring to extend our local markets by canvassing and other means of publicity? These are matters which should receive the earnest attention of everyone engaged in the Gas Industry.

The fact that coke, next to gas, brings in our largest revenue, should be sufficient to spur us on to retain and enlarge our market.

It is quite true that many, and perhaps most, of the large gas undertakings have installed efficient plant for the preparation of suitable coke, but I am afraid that some smaller undertakings have not yet done so. Possibly this is due to the fact that few advertisements of suitable plant appear in the pages of the Technical Press. Generally the advertisements illustrate plant suitable only for large works. Yet, if the directing minds of smaller works realized the advantages of a good coke-grading plant that is complete with elevator and bunkers into which the dust and various sizes of coke may pass from the screen, they would have no hesitation in installing such plant.

Some of the advantages of such a coke-grading plant are as follows: Handling costs are reduced, for the coke is elevated, screened, and graded in one operation. The loading of vehicles and sacks can be done quickly by simply pulling a lever, and this expeditious loading saves transport costs. Customers are satisfied because they can depend upon obtaining a regular sized fuel.

The latter point is of vital importance to many customers, and the knowledge that they can obtain a good quality fuel of uniform size, free from dust, in a short space of time, tends to increase their demand for the coke.

Since installing our coke elevating and screening plant thirteen years ago a saving of £1000 per annum, or 2s. 9d. per ton, has been effected. In addition, considerable saving has accrued to coke merchants by the expeditious manner in which their vehicles are loaded.

While it may be comforting to know that one has little coke stock on hand, I consider it bad policy for a gas-works to run the risk of losing regular customers by being unable to meet their requirements. I have known of large orders being lost through this cause, customers having had to resort to other fuel.

Therms per Consumer.

"Therms per Ton" is a matter very often discussed, and rightly so, but how often do we discuss the equally, or perhaps more, important matter of "Therms per Consumer"?

The analyses of Municipal and Gas Companies' Accounts repay careful study, and show a wide variation in the "number of therms sold per consumer." Among the 112 Undertakings whose accounts are analyzed:

8	undertakings	sell 200 therms or more per consumer.
31	,,	,, 150 to 200 therms per consumer.
59	,,	,, 100 ,, 150 ,, ,, ,,
14	,,	,, under 100 therms per consumer.

The highest figure given is 260
The lowest ,, ,, ,, 62
The average ,, ,, ,, 139

The disparity is surely too great, and a levelling-up would benefit our Industry.

What is the cause of the disparity? It is quite true that three of the undertakings with a figure of over 200 therms per consumer are large centres where the industrial load has been steadily and scientifically built up during many years of patient research. Yet even these undertakings would not agree that they had reached finality in this matter of therms per consumer.

The comparatively small difference in the price charged for gas does not appear to account for the disparity. Is not this figure greatly affected by the facilities offered to domestic consumers in obtaining apparatus in which gas may be used? My view is that apparatus on cheap hire terms is a greater incentive to these consumers than a slightly lower price per therm.

The reliability of gas appliances made to-day justifies a bold policy in loaning appliances on terms of low simple hire. I am satisfied that the simple hire system has effectively assisted the Stafford Undertaking to reach the figure of 170 therms per consumer, and has been the means of consumers becoming more "Gas-Minded."

Permit me to illustrate my point by actual facts:

In 1924, we commenced the hiring of good-class wash-boilers at 2s. per quarter, the consumer paying an additional 15s. for cost of fixing. Since that time 159 boilers have been fixed, out of which the cost of 104 has been recovered by simple hire payments, and, in addition, they are still bringing in a revenue of 8s. per boiler per year. Not many quarters will have to elapse before the cost of the remaining boilers will have been recovered.

During the same period, 280 similar boilers were fixed on three years' hire purchase terms at the rate of 6s. 3d. per quarter, inclusive of fixing.

While it would have been a better commercial proposition to the consumer to have purchased a boiler on hire purchase terms, most of the 159 consumers were not in a position to pay the hire-purchase instalments, and there is no doubt that if the facilities for simple hire had not been available, many of the boilers would not have been fixed.

In addition to the profit made by the simple hire system, a large quantity of gas (on which a profit has been made) has been sold, and the boilers are sufficiently good for another four or five years' service. Apart from the commercial aspect, opportunities have been afforded to the poorer consumers to obtain these labour-saving appliances.

I do not wish to bore you with this question of "therms per consumer," but I do suggest that it is a matter of the greatest importance to the Industry. Every effort should be made to get apparatus installed, if we wish to combat the competition which is daily becoming keener.

Methods Adopted to Increase Sales.

At Stafford, gas is sold on a sliding-scale and according to quantity used, the price varying from 9·54d. to 5·22d. per therm. For many years, in spite of keen competition, the output of gas has been increased. The following are a few of the modest means by which our sales have been maintained:

Consistent and considerable publicity in the local Press.

The adoption in the principal shopping centre of combined Offices and Showrooms through which consumers pass when paying accounts.

Low prices for large quantities have induced manufacturers to use gas for industrial purposes.

The adoption of low standard charges for fixing each type of domestic apparatus.

The conversion of cooker hotplates from two to three boiling burners and grill.

The supply of various sizes of storage water heaters, geysers, fires, &c., on simple hire terms.

The free maintenance of all apparatus.

The mechanism of prepayment meters is set sufficiently low to enable a rebate to be given. This rebate is often used by consumers to meet hire-purchase instalments of gas apparatus.

Five lighting fittings, cooker, and a fire are supplied free of hire to each prepayment meter consumer.

Gas Lighting.

Recently, in a lecture to the Midland Junior Gas Association, Prof. F. W. Burstall, late Vice-Principal Bir-

mingham University, stated that he had reverted to gas for illuminating his study, on account of its softer light which, he found, considerably reduced eye-strain. Such a statement by one so eminent and impartial cannot fail to be an encouragement to us in our efforts to retain the lighting load.

I consider that sufficient publicity is not given to the superiority of gas lighting over every other artificial illuminant. Its importance should, I think, be emphasized on every possible occasion, and perhaps even by a national campaign. Furthermore, I am of opinion that research work should be undertaken to devise a thoroughly satisfactory and reliable lighting fitment, complete with automatic lighting arrangement.

It must be remembered that the foundation of the Gas Industry was gas lighting, and surely the Industry is now sufficiently wealthy to provide funds for research into this vitally important subject. Intensive research should, I think, also be undertaken to extend the uses of gas in other directions. Twenty years ago the gas turbine was mentioned as a possibility in this direction. At that time it was not practical because the metal of the component parts was unsuitable. Are suitable metals available to-day, and, if not, can they be provided by research? Or cannot means be found to reduce the temperature of the products of combustion after explosion, so that they can be dealt with without destroying the metallic parts of the machine?

To maintain a research staff and laboratories would, of course, need a substantial annual sum, yet I feel that the day has arrived when the matter should receive earnest and sympathetic consideration. The time is with us when research should be considered as the first, or a very early, charge on the Gas Industry. A contribution of 2s. 6d. per million cubic feet of gas sold in the United Kingdom would provide a sum of £36,000 per annum. This sum should go some way towards meeting the requirements in this direction.

The manufacturers of gas appliances have done yeoman service in bringing gas-consuming apparatus to a high state of efficiency and reliability. It is not too much to say that the Gas Industry would not have progressed so far had it not been for the energy displayed by appliance makers in inventing and constantly improving apparatus. While much has already been accomplished, yet there is still much more to be done.

There is, I think, a definite need for apparatus for heating small bathrooms, since, with the advent of the insulated storage heater, the heat formerly supplied by the hot water cylinder is not now available. It should be possible to devise a suitable panel heater or a fire which might be fixed to the wall and fitted with fuel having a high therapeutic value. Further, is it too much to hope that in the near future a satisfactory flueless gas fire will be devised?

Improvements also in the operation of gas apparatus might well be conceived. Gas fires fitted with thermostatic control valve operated by the room temperature would be a welcome improvement, while fires operated by distant control device would increase their popularity. It will be generally agreed that a portion of our lighting load has been lost to the switch. Is it not possible that for the same reason a portion of our heating load may be lost?

I have faith that our great Industry will attain further greatness in supplying the needs of mankind if we are true to ourselves—if everyone connected with the Industry will do his utmost to improve the methods of manufacture, to devise additional gas-consuming apparatus, and to market the residuals in such a condition that they will be beyond reproach.

In conclusion, I should like to pay a warm tribute to the Officers of the City of Birmingham Gas Department for their efforts in introducing gas for the propulsion of vehicles, to the Kettering Gas Company for the successful promotion of their Bill, and to the Junior Associations for the excellence of their members' papers.

Mr. TOMLINSON, proposing a hearty vote of thanks to the President for his address, remarked that Mr. Poulson had given them a great deal to think about, and if they studied carefully all he had said they would derive a great deal of encouragement. There was no doubt that to increase the therms per consumer would reduce the price of gas to an even greater extent than would an increase of a few therms per ton.

Mr. T. F. E. RHEAD (Birmingham) seconded the vote, and expressed his indebtedness to Mr. Poulson for his extremely instructive address.

The PRESIDENT, after acknowledging the vote, which was heartily accorded, called upon the Chairman of his Committee to make an announcement. He remarked that the Vice-Chairman would also have been present, but that he was unable to leave Stafford. He took the opportunity of thanking his Chairman for the manner in which he had always backed up the Engineer and staff of the Stafford Gas-Works. Councillor Owen was a good friend to the Gas Industry, as were also the members of his Committee.

Councillor OWEN remarked that he had greatly appreciated the address to which they had just listened. So far as he was concerned, as Chairman of the Stafford Gas Committee—and this applied to the Committee itself, and to the whole of the Corporation—the utmost confidence was reposed in their Gas Engineer. He asked the members of the Association to accept an invitation from the Gas Committee and the Corporation of Stafford to hold their next meeting there, when he hoped the members would have in mind the points that had been raised in the address that afternoon. He gave them a hearty invitation to meet on May 25 in the Borough of Stafford.

Oil from Coal

Professor C. H. Lander, of the Engineering Department of the Imperial College of Science, London, lecturing on "Oil and Motor Spirit from Coal" at the Birmingham and Midland Institute, stated that a type of oil had been obtained from coal for many years in the tar which was produced as a bye-product in both the gas and metallurgical coking industries. From both tar and gas, benzole, which was a particularly useful form of motor spirit, could be extracted.

By carbonizing coal at lower temperatures than were used in gas-works larger quantities of tar of a nature more akin to natural petroleum could be obtained, but the amount in relation to the original coal used was still comparatively small—say, about twenty gallons of liquid per ton. From this about one gallon and a half of motor spirit could be extracted and an additional 2 gallons of spirit could be obtained from the gas. The liquid products could, therefore, only form useful bye-products of a low carbonization process. The main product would be a particular form of coke which could be used on the domestic grate, as it lighted easily and gave a cheerful fire which many people preferred to the coal fire.

Motor spirit formed by far the largest proportion of liquid fuel used in this country, our requirements at present amounting to about 1000 million gallons annually.

Prof. Lander gave it as his opinion that low-temperature carbonization could take an important place as a means of reduction of domestic smoke, but, as operations increased in magnitude, a problem of the disposal of the heavier fractions of the tar would inevitably have to be faced. Both the motor spirit and the fuel oil obtained from tar could be prepared so that they had qualities in no way inferior to those possessed by the natural material, petroleum. If a sufficiently high price could be maintained for the smokeless fuel made, the other products could compete in price with natural oils. By hydrogenation coal could be liquified and so made to produce much larger proportions of motor spirit, upwards of 160 gallons per ton. To do this, however, for every ton of coal treated an additional ton of coal would be necessary to carry out the process.

Motor spirit could be made to sell, *ex* works, at about 9d. per gallon, as against 3d. or 4d. which it cost at present when entering our ports. It would be seen it could not compete with petroleum spirit at present on an equal footing, but it should be remembered there was import duty of 8d. per gallon applied to the imported material.

If the whole of our requirements of motor spirit were made by hydrogenation, about 12 to 15 million tons of coal would be required.

Manchester District Association of Gas Engineers

Presidential Address of Mr. G. Dixon, Nottingham

The Annual Meeting of the Manchester District Association of Gas Engineers was held at the Midland Hotel, Manchester, on Friday, March 10, Mr. C. W. WARD, Assoc.M.Inst.C.E. (Wakefield), presiding.

Mr. William Edward Stephenson, Gas and Water Engineer, Gas-Works, Audley, and Mr. F. C. Sylvester, Engineer and Manager, Gas-Works, Earlestown, were formally inducted members of the Association.

The Annual Report and Statement of Accounts, showing a balance in excess of that carried forward in the previous year, were unanimously approved and adopted, Mr. H. R. S. WILLIAMS (Altrincham) speaking in terms of appreciation of the economical manner in which the Hon. Secretary (Mr. J. Bridge) had conducted the affairs of the Association.

The Report of the Yorkshire Commercial Section was submitted by Mr. C. S. Shapley (Leeds), who referred to the excellent result obtained by Mr. H. E. Bloor, Engineer, Manager, and Secretary of the York Undertaking, in floodlighting York Minster and its adjacent grounds by gas. It had proved to be an excellent advertisement of the merits of gas for such purposes, the effect being much better than could be obtained by electricity.

Mr. H. R. S. WILLIAMS submitted the Report of the Manchester District Commercial Section, in which the Committee referred, with regret, to the loss by death of their esteemed colleague, Mr. R. H. Ginman, of Leek.

It was unanimously resolved that the sum of 10 guineas be granted to the Benevolent Fund of the Institution of Gas Engineers, several members, including Mr. R. E. Gibson, President of the Institution of Gas Engineers, and Mr. C. S. Shapley (Leeds), expressing the hope that at some future date it would be possible to support the fund even more generously.

The meeting further unanimously resolved that Mr. G. Dixon, B.Eng., A.M.Inst.C.E. (Nottingham) be appointed the representative of the District Association on the Council of the Institution of Gas Engineers.

Mr. W. Buckley (Manchester) and Mr. W. B. McLusky (Halifax) were unanimously appointed representatives of the District Association on the Councils of the Manchester and Yorkshire Junior Gas Associations respectively.

Mr. G. Dixon, B.Eng., A.M.Inst.C.E. (Nottingham) was then formally inducted as President of the Association.

In taking the chair, Mr. DIXON referred to the excellent work done during the past year by Mr. Ward, and presented him with the Medal of the retiring President.

Mr. WARD suitably responded.

PRESIDENTIAL ADDRESS

By G. DIXON, Nottingham.

As the thought which is uppermost in my mind, may I first express my thanks for the very great honour you have done me by adding my name to the list of very distinguished engineers who have occupied the Presidential Chair of this Association during the past 63 years.

No greater honour can come to any man than that he should be elected by his professional friends in the district in which he has worked since he joined the Industry.

It is with considerable pride that I record our satisfaction that this Association is honoured by the election of one of its members to the highest position the Gas Industry can offer, and in your name I extend our congratulations and best wishes to Mr. R. E. Gibson, the President of the Institution of Gas Engineers.

Mr. T. H. Poulson—another member of this Association—has brought further honour to us and is occupying the Presidential Chair of our sister Association in the Midland Area this year.

In view of my removal from this immediate district to Nottingham the question of a suitable subject for my Presidential Address has given me some concern.

Up to my taking office as Junior Vice-President I was associated with a new type of plant at Lancaster, and I had collected much information which I had hoped I would be able to communicate to you. Such plant is, however, not now under my control, and I therefore consider it better that any details of its working should be dealt with by those now responsible for it.

Some special results obtained were submitted in a paper-

ette some eighteen months ago, and I hope it will be possible to have full details published at some later date by my successor.

It is sufficient for me to note that the plant has justified all the preliminary uphill work that had to be given to it and that the results now being obtained are even better than those which I was able to report.

My year at Nottingham has been spent in making myself acquainted with the changed conditions of a Midland city with regard to coals, markets, labour, and potential gas outlets; and we are now engaged upon general re-organization in the light of modern practice in all branches of the Department.

I shall be grateful if you will here allow me to record my deep appreciation of the welcome and assistance given to me by my brother engineers in my adopted area and especially by my predecessor, Mr. John Wilkinson.

THE PRESIDENT

G. DIXON, Nottingham.

Mr. Dixon served his apprenticeship to general engineering with the Mersey Engine Works Company, Liverpool. From 1905-08 he took an Engineering Course at Liverpool University, and graduated B.Eng. From 1908-10 he was articled to the late Isaac Carr, M.Inst.C.E., Widnes Gas and Water Department and Consulting Engineer, and for the following two years was Technical Assistant, Gas and Water Department, Widnes. Then he was appointed Chief Assistant to the late J. H. Crowther, Wallasey Gas and Water Department, a post he occupied for seven years. During this period he was elected an Associate Member of the Institution of Civil Engineers. In 1919 he became Engineer and Manager to the Lancaster Corporation Gas Department, and carried out complete re-building and re-organization. In 1932 he was appointed Engineer and Manager to the Nottingham Corporation Gas Department.

Under my changed circumstances I believe that the best course for me to adopt is to offer a few general criticisms and suggestions in the hope that they may prove of use in helping us to ensure that such experience and information as exists may be made available and that our Industry may progress as a team rather than as individual members.

STAFF TRAINING.

Perhaps the most notable change of the last few years has been the improvement in the personnel of the juniors

in our profession, but I am concerned with the fact that many chiefs still do not give them that degree of responsibility which is so necessary for their training and so helpful to the undertaking they serve.

The highly scientific design of modern gas plants on the manufacturing and distribution sides both warrants and demands never-ceasing chemical and physical control, and it is surprising to find engineers with well-trained assistants on their staff who fail to hand over reasonable control and allow these juniors to fit themselves for the higher positions when opportunity arises.

I do not attempt, of course, to absolve the juniors from some responsibility for this, but my personal observations in the past have led me to the conclusion that seniors can do much to help themselves and the Industry by giving more attention to this valuable work. I am prompted in these remarks by the fact that I count myself among the fortunate ones, having served during my early life two engineers of very different personalities, but both of whom gave ample opportunity to me for accepting responsibility and gaining experience—both gentlemen giving credit for any work done correctly and forgiving any errors made—and I am grateful for my association with those two chiefs.

Education Scheme.

I congratulate the Industry upon the success achieved by the Education Scheme, although I believe much can yet be done if District Committees would make a better endeavour to gain touch with prospective students for external courses and see that their educational programme is sound from the commencement of their studies.

There is a tendency for these juniors to be left to the recommendation of local technical school heads who group them into their own standard courses which in many cases are not fitted to the requirements of the Institution Education Committee.

A system of mapping out approved subjects from the start would save much detail work of the District Committees by eliminating many applications for exemptions at a later stage.

The greater care in the recruitment of men for the Industry and the number of very highly-trained technical men now available is most encouraging and ensures a high standard of technicians for the future.

Our Industry is unique in its many ramifications and in increasing measure as progress is maintained must find employment for engineers, physicists, chemists, and fuel technologists, to name only the branches of the works side, who must work together in the closest co-operation.

I heartily welcome the tendency for closer understanding between the Senior and Junior Associations, and I would pay a tribute to the high standard of the work of the Juniors and the value of their contributions to our technical transactions.

Works Practice.

In spite of all that has been written in the past, works practice still provides us with as many interesting problems as ever.

When the ultimate balance-sheet is obtained equal claims may be made by the champions of each type of carbonizing plant—horizontals, verticals, intermittent chambers, &c., and the choice is largely governed by local conditions such as available site, distance of coal supplies, local coke market, and quality of gas best suited to the area.

In the daily clamour for higher thermal yield each plant is being designed to work at so high an efficiency as to require a degree of technical control not dreamed of a few years ago, and I share the view that the desire for therms has necessitated temperatures which have outrun the physical attainment of the refractory materials employed, so that maintenance costs are more than outweighing the benefits obtained.

I would prefer to see a halt called and attention concentrated upon the possibility of better yields being obtained by blending of coals or other modifications of practice now being investigated by fuel technologists of the Industry and the Fuel Research Board.

The blending of coals has the greatest appeal to me because of the possibility of a much wider choice of fuels and the greatly improved quality of coke produced for the domestic market.

Coke.

Coke still forms our chief revenue-producing residual, but it is surprising to find undertakings who do little or nothing to ensure a satisfactory fuel or possess anything in the nature of a selling organization to deal with it.

So much has been said on this subject in the past that I am reluctant to mention it here, but I am prompted to do so because of the conditions I found at Nottingham when I took over control twelve months ago. Our coke is produced from Nottinghamshire and Derbyshire coals, and proper care is taken in its production, sizing, screening, and marketing. Not only is there a good demand, but we are obliged to ration our customers outside the area, and we are refusing orders daily.

The coke is made in vertical retorts and is of a very open and free burning nature, and my predecessor was able to build up such a demand as to create the present almost embarrassing position.

For some years back I have given care to the production of a good coke and appointed a representative to call upon customers to see that they were getting satisfaction. The results have been most encouraging. We have been able to rectify many cases of trouble due to the incorrect size of coke being used and the personal contacts made have brought us an amount of goodwill and ensured us a regular demand from local consumers.

Tar.

Tar still does not receive the consideration it deserves. This is generally due to the fact that most undertakings sell their tar crude to distillers, and they have not therefore thought it worth their while to study the problem of its ultimate use.

The very stringent tightening-up of all specifications for road tar has resulted in the production of a product which is finding increasing favour with road authorities, and in order to maintain this quality I am in favour of all works, except those large enough to own efficient distillation plants and close chemical supervision, disposing of their tar to large distillers on a co-operative basis.

There can be little doubt that the fight for road tar to become recognized at its full value has been made more difficult by the practice of some producer distillers supplying tar of varying and unsatisfactory quality without realizing the loss of goodwill to the tar industry generally caused by their very small quantity of inferior make.

Whether individual members are distillers or not I would urge that they make themselves acquainted with the use of the finished product and take a close interest in its application in their own district.

An opportunity presents itself—especially in municipal undertakings—of keeping a close personal contact with the highway engineers, and reports upon successes or failures of the material can be communicated directly to the distillers.

It is true that many criticisms of the tar are often due to causes outside the scope of either the producer or distiller, but the personal contact obtained is invaluable and will do much to help the position of the Industry in the future.

In this connection I would like to congratulate the founders of the British Road Tar Association—one of our national organizations which has more than justified its existence. As one who has had the privilege of seeing the inner workings of the Association I have been most encouraged with the work they have been able to accomplish among distillers and users alike, and my only regret is that so much of this work has been done without the general body of members being made acquainted with it.

Costing.

In these competitive days I believe that one of our greatest needs is a standard method of costing so that a truly comparative analysis of all works can be made.

Our present analysis published by the Technical Press—invaluable and excellent as it is—does not go far enough because individual works do not cost on the same basis.

I have for years used the published tables for the purpose of finding out where my own undertaking is weaker than others and then trying to remedy any slackness. The results have far more than repaid any trouble taken in the search, but I have often been misled by the costing systems adopted in various works being incomparable. It would, I think, be possible for our National Association to devise and standardize a common costing basis which I believe would prove a means of assisting each works to check its own expenditure.

If any member thinks that this subject is not worth while I would remind him that some undertakings invariably produce better results than others. A survey of the town's size, activities, or other conditions does not always provide the solution, and there are often other reasons which are applicable to their own undertaking.

Industrial Gas.

No subject in connection with our Industry has created such interest as the possible field for gas for industrial purposes. Economic conditions have demanded that industrialists shall produce their goods of such a quality and at such a price as will enable them to compete in the keenest of markets, and one of the determining factors is efficient process work.

Thanks to those pioneer undertakings who have done the

research work for us, it has been established that gaseous fuel can play a most important part, and there opens up to us opportunities of which we must be ready to take advantage without delay.

In common with other members I have been actively engaged on some of the problems in connection with this matter for the past twelve months, and I am satisfied that our most urgent need is for co-operation among ourselves and with the makers of the necessary appliances and furnaces.

The most encouraging feature is the interest of industrial concerns in gas as a fuel, as evidenced by the willingness with which they are prepared to listen to our propositions.

Works managers are now "gas minded," and business will result if we can demonstrate economic working. Gas authorities are often called upon to spend appreciable sums of money to make these demonstrations, and success is sometimes made more difficult by the fact that furnace makers have not paid as much attention to gas firing as it warrants.

In making demonstrations one is conscious that many works are investigating the same problems and there is consequently much overlapping of work. Some clearing-house for information is urgently required, and we are greatly indebted to those undertakings who have already established industrial laboratories for their generous offer of help.

With the co-operation of the undertakings and the furnace makers I visualize a small industrial demonstration room established in every town and linked up with the larger towns for special work. Some of these demonstration rooms could be established in conjunction with a local technical school where metal trades students could participate in the experimental work. Results would be centralized and be available for anyone interested.

Such an organized chain of experimental centres would, I believe, do much to bring the claims of gas before all potential industrial users.

Before leaving this subject I would like to urge the danger of delay in getting to work. The problems met with are difficult and varied. Let no member neglect the consideration of the matter until it is too late to do the preliminary experimental work. With the revival of trade and the releasing of money for re-organization of factories and works will come increasing competition from other types of fuel.

Great as is the record of this Association, I would like us very carefully to consider whether the sphere of usefulness could be made more valuable, especially by the collating and spreading information relating to the many problems of to-day.

While I admit the urgency of the sales side has rather overshadowed other considerations, there is a deal of technical information required to enable us to get our costs down to such a figure as will enable us to procure the potential business, and I believe our Association could be the means of preventing a good deal of overlapping in individual research work by forming itself into a clearing-house for technical problems and communicating knowledge at monthly meetings carefully organized so as to encourage those members from whom we hear little but who are able to give us most valuable information as the result of their own practical work.

I have purposely been brief, because the problems before us are well known to you all. These problems are not for the academic technician or accountant alone. They are to be solved only by a determination and team spirit throughout the whole of the members of the Industry—employers and employees alike—and the time for action is NOW.

Let us see that each of us rises to his responsibility.

Votes of Thanks.

Mr. R. E. Gibson (Liverpool), President of the Institution of Gas Engineers, proposed that a hearty vote of thanks be accorded to Mr. Dixon for his address. He had a peculiar pleasure in proposing the vote of thanks because the new President was really a Liverpool man. He was born in Liverpool, educated in Liverpool, took his degree at the Liverpool University, and received his training on Merseyside. Personally, said Mr. Gibson, he was in full sympathy with regard to the views expressed in the address respecting coke sales and a standard method of costing. The published figures of gas undertakings at the present day were really not comparable, because they were based upon different systems of costing. He had tried, many times, to compare Liverpool results with those of other towns, and had been unable to do so in a thoroughly satisfactory manner. This remark applied particularly to works costs. Furthermore, he considered that there was scope for great co-operation in the Industry with respect to the possible uses of gas for industrial purposes. As they were aware, there was a national movement on foot for dealing with the question, and it was hoped that great results would be achieved in the future in that field of operations.

Lieut.-Col. W. M. Carr (Stretford), in seconding the vote of thanks, said he was especially pleased to do so, because, in his early days, he was associated with Mr. Dixon as a fellow student. Throughout all the years which had elapsed since that period he had maintained the high opinion he held of him in his student days. In commenting upon the statements made in the address concerning the necessity for further consideration in regard to the distillation of tar and its subsequent use, Mr. Carr said that in Lancashire, where operations were conducted on what was termed a co-operative basis, it was felt that tar producers were not only selling their product to the distillers, but that they were, in fact, equally concerned with them in its distillation and marketing. He agreed with the views expressed by the President of the Institution of Gas Engineers respecting the enormous value of costing on a common basis, but he would suggest that it might not be possible to get down to a common denominator because there were so many local factors to be considered. The situation in relation to coalfields, and particular residual markets existing in the vicinity of undertakings, would, naturally, cause variations to occur in the all-important figure of net cost of coal. Apart from the net cost of coal, other costs, such as repairs, maintenance, &c., would be a great help, particularly when considering different types of carbonizing plant and the cost of maintaining these different types. The question of industrial gas was one in which he was very much interested. Whatever central organization was set up for the distribution and collation of data with respect to industrial gas, the distribution of that information and the establishment of demonstration rooms would be of no avail unless gas undertakings themselves were prepared to develop industrial business. Many engineers said they had no industrial load, yet every town or district was more or less plentifully studded with garages, for instance, which were potential consumers of industrial gas. Gas-heated appliances could be sold for the purpose of cleaning engine parts, and so on, and should be in every garage to-day. An interesting appliance of the kind was exhibited at Birmingham.

Mr. J. Wilkinson (formerly Gas Engineer, Nottingham) proposed that a hearty vote of thanks be accorded to the Committee and Officers of the Association, and to Mr. J. Bridge (Elland) for their services during the past year.

Mr. Thomas Reynolds (Stockport) seconded the vote of thanks, which was carried unanimously.

Mr. J. Bridge (Hon. Secretary of the Association), in responding to the vote of thanks, pointed out that the funds of the Association would not, at present, permit of an increased subscription to the Benevolent Fund of the Institution of Gas Engineers. He made, however, a special appeal to all members to become subscribers to the Fund. If they would do so the amount available would be increased by from £20 to £40 per annum. He further stated that the membership of the Institution of Gas Engineers was 1467, whereas the number of subscribers to the Benevolent Fund was only 821. During 1931 the number of cases assisted from the Fund was 21, and the amount expended £695, as compared with £595 in the previous year.

Compressed Gas for Motor Vehicles.

At the invitation of the Gas Committee of the Birmingham Gas Department, members of the Midland Junior Gas Association visited the Windsor Street Gas-Works on Saturday, Feb. 18, where they saw town gas being used in an internal combustion engine for the propulsion of vehicles.

The party were welcomed by Dr. C. M. Walter, Engineer-in-Charge of the Industrial Research Laboratories, who has pioneered this work in Birmingham.

As a result of the tests carried out by the Industrial Research Laboratories of the Birmingham Gas Department on standard engines, a van belonging to the Undertaking, fitted with a 20-h.p. Austin engine, has been equipped with five standard steel cylinders, each 5 ft. 10 in. by 8 in., with a working pressure of 3000 lbs. per sq. in., giving a total storage of 1750 c.ft., and full details of gas pressure control and the method of automatically feeding it to the engine, and of the air-gas mixer, &c., were given.

The vehicle has completed about 200 miles on the road and is giving every satisfaction. In a trial run it attained a speed of 55 miles per hour with a gross weight of just over 3 tons and a consumption of approximately 21 c.ft. per mile, compared with 12 miles per gallon on petrol—in town work over a period of three weeks the consumption averaged 22 c.ft.

The compressing plant consists of a 4-stage Belliss & Morcom gas compressor with inter-coolers between each stage and an after-cooler after the final stage.

The visitors spent an interesting afternoon and were also able to have a run in a passenger-carrying 'bus which had been fitted up to run on town gas ready for the British Industries Fair.

A hearty vote of thanks was voiced by the President (Mr. F. A. C. Pykett, of Coventry).

NOTES ON PLANT AND PROCESSES

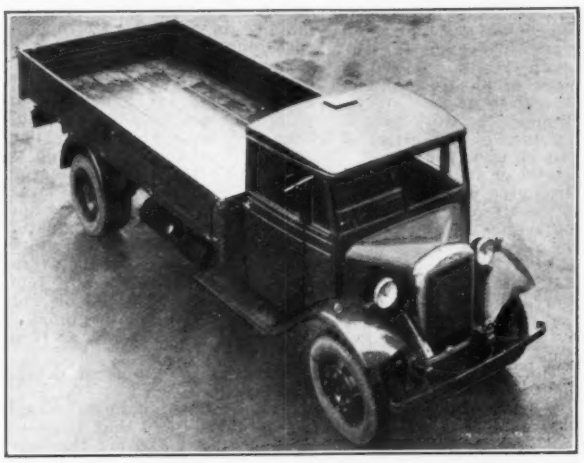
Morris-Commercial Enterprise.

Range of New Vehicles.

Morris Commercial Cars, Ltd., have constructed an entirely new range of amply-powered 6-cylinder vehicles, which comprises 30-cwt., 2-ton, and 3-ton models. Production of these vehicles commenced on March 1 last.

One of the most important features is that both normal and forward control types are offered in the 30-cwt. and 2-ton short wheelbase models. The manufacturers envisage that the trend of operator opinion is likely to gravitate towards the forward control models in view of the numerous advantages this class of vehicle offers, among which might be instanced the longer platform space, which enables the carrying of bulky loads up to the rated load capacity, the scientific distribution of the load, economy in garage space, and, finally, the ease with which machines of this nature can be manœuvred in traffic and confined areas.

With an eye to impending legislation the firm have produced a genuine 3-tonner having an unladen weight of less than 50-cwt., and which accordingly possesses the distinct advantage of being able to operate at the maximum permitted speed. It retails at a very low figure.



New Morris-Commercial.

In designing the machines consideration has been given to the question of interchangeability of parts, and the percentage of parts common throughout the whole range is very high.

Notable points in the design of the vehicle are Lockheed hydraulic 4-wheel brakes, progressive rear springing; silent twin-top gearbox; fully floating rear axles on all models; 12-volt lighting and starting set; finger tip controls; chromium plated radiators; roomy all-steel cab on normal control models, providing maximum of driver comfort and safety.

The Nellissen Gas Detector.

This apparatus has been on the Continental market for some years past, and received the 1st Prize at the Competition held by the Mines Department of the Prussian Board of Trade in 1925. It is protected by numerous patents, and has recently been further improved.

It is claimed that this gas detector, which was demonstrated to us last week, is able to indicate 0·3% of gas in air; it is unaffected by change of temperature, robust in construction, handy in size, and foolproof.

The dimensions of the Nellissen gas detector are about 3 in. diameter and 9 in. high, and the weight is only 5½ lbs. It is fitted with a carrying strap for portable use.

The principle on which the detector works is the law of diffusion of gases. The rate of infiltration of gas through a porous wall varies with the specific gravity of the gas. The infiltration of a light gas is more rapid than that of a heavy one, and in a closed chamber containing air at atmospheric pressure a recordable increase of pressure is set up. This pressure is recorded on a scale by liquid in a U-tube, one arm of which is connected to the interior of the porous closed chamber, while the other arm is open to atmospheric pressure.

To record the rise in pressure, it is necessary that infiltration by the gas shall be sudden. This is ensured by enclosing the closed porous wall chamber within a gastight container, which can be scavenged with fresh air after every reading, so that it remains full of fresh air until such time as it has to be recharged with gas for a new reading to be recorded. The charge of gas is effected by a rubber bulb and tube, provided with a desiccator at the inlet, filled with calcium chloride to absorb any moisture. A perforated cap at the top of the apparatus is rotatable to the working or scavenging position, the holes in it also allowing any excess of gas to escape after charging.

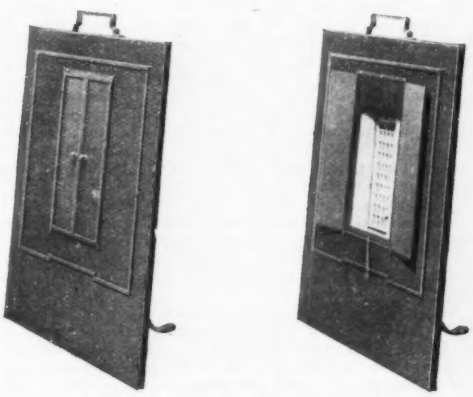
The lower portion of the apparatus consists of an air vessel into which air can be pumped through a valve in the base by means of an ordinary pump, up to a pressure of about 90 lbs. per sq. in. This compressed air is utilized for scavenging purposes in the two types of the apparatus so fitted, a non-return valve actuated by a press button being provided for this purpose at the top of the cylindrical air container. The amount of air actually required for effective scavenging is small, so that a charge of compressed air lasts for a considerable time.

In special cases, Nellissen gas detectors can be arranged as fixtures to record the presence of gas in any particular space.

It is stated by the makers that the Nellissen detector is capable of giving sixty accurate readings per hour. International Commer Service, Ltd., 106, Regent Street, W. 1, are dealing with the instrument in this country.

The "Portcullis" Portable Fire.

The other day we were most interested in an inspection of a new—and certainly an attractive—portable heater, the design of which renders the appliance suitable also as a firescreen. The workmanship of this new piece of apparatus is excellent, and its efficiency and safety are beyond doubt. No flue is needed, and with the maximum consumption of 8 c.ft. an hour the cost of warming a room of average size approximates one penny for three hours. Since all the heat produced enters the room, the fire is equal to a 6-radiant gas fire of normal type and is equivalent in heating capacity to a 1-kilowatt electrical heater. To give equal costs electricity would have to be supplied at ¼d. per unit, with gas at 8·6d. per therm.



(*a*) (*b*)

The "Portcullis"—(*a*) Closed: (*b*) Open.

From the Gas Industry's point of view the unusual form of radiant will create much attention. The appliance (it is named the "Portcullis) provides at the same time both radiant and convected heat—necessarily the most pleasing economical combination. And, as we have said, it does this safely. The heating unit—burner, refractory backing, and radiant—has been designed on scientific principles by the Gas Light and Coke Company, who hold the patent. A governor is an integral part of the heater, and the gas consumption cannot exceed 8 c.ft. an hour.

The "Portcullis," which is made and marketed by Messrs. Bratt Colbran & Co., and the Heaped Fire Company, Ltd. (10, Mortimer Street, London, W. 1), is in fact soundly made and of handsome appearance; it is supplied in "Staybrite" rustless steel or in bronze finish or colour finishes. It will, we think, prove a useful and highly acceptable addition to the Gas Industry's range of heating equipment.

South Suburban Gas Bill

House of Lords Committee

(*Before the* MARQUIS OF BRISTOL, M.V.O. (*Chairman*), *Earl* EFFINGHAM, *Lord* MENDIP, *Lord* FOXFORD, *and Lord* COZENS-HARDY.)

The purpose of the Bill is to enable the South Suburban Gas Company to charge differential prices in different parts of its limits of supply, varying from ¼d. to 2¾d. per therm above the price charged in the more populous Metropolitan or inner area. For the purposes of the proposals the area of supply has been zoned in accordance with characteristics and geographical positions, the object being to bring the charges more into relation with the costs of supply in the various zones, and to reduce the price in the Metropolitan area. At present a uniform price applies throughout the greater part of the Company's large area. The Company proposes to reduce the basic price, because it is not the intention to increase dividend authorization. There was opposition by a number of local authorities whose areas will be affected by the application of the proposed differentials.

The Company was represented by Sir Lynden Macassey, K.C., Mr. W. E. Tyldesley Jones, K.C., Mr. H. Craig Henderson, K.C., and Mr. H. Royston Askew.

The opponents were the Bromley Rural District Council, and the Sidcup Urban District Council, represented by Mr. F. J. Wrottesley, K.C., and Mr. F. N. Keen; the Dartford R.D.C., represented by Mr. F. N. Keen; the Beckenham U.D.C., represented by Mr. J. H. Thorpe; the Bexley, Erith, and Crayford U.D.C.s, represented by Mr. Sydney G. Turner, K.C., and Mr. Jacques Abady; and the Northfleet and Swanscombe U.D.C.s, represented by Mr. F. G. Thomas, C.M.G., K.C.

Tuesday, March 7.

Sir LYNDEN MACASSEY, K.C., in his opening address, traced briefly the history of the Company since it was first constituted, as the Crystal Palace and District Gas Company, supplying in an area comprising Sydenham, Forest Hill, Beckenham, and other suburbs, which area is now referred to as the Metropolitan area. Amalgamations from time to time extended the Company's area to 255 sq. miles.

(The Company's area now extends over a wide area in Kent, including riverside areas almost as far east as Gravesend, while it extends as far south as Sevenoaks and Tonbridge.)

The necessity for the proposed adjustment of charges, said Counsel, had arisen from the changes in local and social conditions since the war; the post-war houses differed both in character and situation from those commonly erected before the war, and there were important changes in the mode of life of the occupants. These factors had altered completely the distribution of costs of gas supply in the various areas supplied by the Company. For some time past the disparity between the costs of supplying the outer districts, as compared with the Metropolitan district of the Company, had been growing, and it had become necessary to take action to distribute the costs more evenly. The consumers in the Metropolitan area, which was the most densely populated, were under present conditions subsidizing the supply of gas in the outer areas, so that the consumers in those outer areas were charged less than the economic prices; a subsidy of that sort was essentially wrong, and the result was to prevent the Company developing as it would like to do and ought to do. Parliament had been in the habit, certainly since the war, of adjusting charges made by suppliers of gas, water, and electricity in order to bring those charges into conformity with the altered conditions which had arisen since the war, and had always been prepared to alter agreements where necessary; so that the Company, in asking for modifications, was following the practice and principle of Parliament.

The Board of Trade Returns showed that, of 430 companies, no fewer than 170 had been granted, either by Parliament or by the Board of Trade, different prices in the different parts of the areas they supplied; and of 249 local authorities owning gas undertakings, 81 had obtained such powers. Of the 66 local authority gas undertakers in Scotland, 22 had been authorized to make differential charges. Since 1919 the Board of Trade had made 133 Orders and Parliament had passed 38 Acts authorizing supplies of gas in particular areas, and providing for differentials. In 126 of those Orders, provision had been made for differentials to be permanent either in whole or in part, and in only 7 had provision been made for the ultimate disappearance of the differentials; in only 3 of the 38 Acts was it stipulated that the differentials should disappear ultimately, and in 35 they were to be permanent in whole or in part.

CHANGED HOUSING CONDITIONS.

Emphasizing the changes in the nature of post-war development which had made it incumbent upon the Company to ask Parliament to re-adjust charging powers in the outer areas, he pointed out that before the war an area could not be developed for housing purposes unless it was within reasonable proximity to the developed area to which it was attached, because in those days there were not such transport facilities as existed to-day; therefore, the expense incurred in providing a supply of gas was less than it is to-day. Post-war housing was developing in situations more and more remote from the Company's Metropolitan area, and it was necessary frequently to provide very great lengths of main, at increased expense. As an example, he said that on one estate at Sidcup there were 570 houses, and a feeder main 2459 yards long, costing £7178, had had to be provided to supply it. The additional cost represented by that feeder main was equivalent to £13 1s. per house above the average cost of providing the supply per house—*i.e.*, it represented an increase of 142% per house. That sort of thing was going on generally over the area of supply, and unless the Company was able to make additional charges in such areas, the consumers in the Metropolitan area had to subsidize them.

Whereas before the war the houses were built closely together, frequently in terraces, with small gardens or no gardens at all, so that they were near to the roads, and the roads were of flint, post-war houses were separated from each other, there being only about 12 per acre, their gardens were substantial, they were situated at considerable distances from the roadways, and, inasmuch as the roadways were of concrete, duplicate mains had to be provided. Thus, the number of consumers per mile of main was less.

Again, owing to the increased facilities for amusement, the people spent less time in their homes during the post-war period than they did before the war, so that they consumed less gas; and those living in the areas now developing consumed less gas than similar families living in the Metropolitan area. The capital costs of providing supplies varied as between the pre-war and the post-war types of houses. For purposes of illustration, Counsel pointed out that on two estates of artisan houses erected before the war at Sydenham and Bromley the work necessary to provide a supply of gas, assuming present-day prices of labour and materials, represented a cost of £2·83 per house; the cost of providing a supply on two estates of artisan houses on post-war estates at Bellingham and Orpington was £8·21 per house. That difference was due largely to the altered conditions of development. On two pre-war housing estates inhabited mainly by persons in clerical occupations the average cost per house of the work done in order to provide a supply, based on present-day prices, was £4·02, but the average cost actually incurred was £2·86, which latter figure represented the capital which had to be remunerated and on which the charges were based; on two post-war estates inhabited by a similar type of person, however, the cost was £8·12 per house.

The CHAIRMAN asked if the changed conditions of development were due to town planning schemes.

Sir LYNDEN MACASSEY replied that town planning schemes were largely responsible, but he would not say that those who had actually developed the housing estates had not themselves been responsible for a good deal of the improved development.

To show the extent to which the consumption of gas was less in post-war than in pre-war houses, he said that whereas the average consumption on two housing estates built before the war, and occupied by persons engaged in clerical occupations, was now 30,291 c.ft. per annum, on two post-war estates the average consumption was 19,840 c.ft., so that there was a decrease of about one-third, and that could be regarded as more or less typical and representative.

In the Metropolitan area the number of consumers per mile of main was 262; in the adjoining Bromley area it was 154; in the Crays area 105; in the West Kent area 57; in the Dartford area 130; in Northfleet 149; and in two other areas 65 and 86 respectively.

As the various areas had been acquired by the Company from time to time differential charges were authorized, but in most cases it was arranged that they should diminish gradually and disappear ultimately. The only differentials remaining at the moment were in the Northfleet area, under an Act of 1929, and in the Tonbridge and Sevenoaks areas, authorized in 1932; the only permanent differentials were those authorized in 1932.

For the purpose of arriving at the differentials now proposed the whole of the Company's area was zoned, on the advice of experts in gas engineering and accountancy, and in accordance with the conditions from the point of view of gas supply. In the Bromley area, which adjoined the Metropolitan area, the proposed differential was ¼d. per therm; in a district embracing Erith, Dartford, Bexley, Orpington, Sidcup, and Crayford, a differential of ¾d. was proposed; and for other districts there were differentials of varying amounts up to a maximum of 2¾d. The zones were not coincident with the areas originally supplied by companies acquired by the South Suburban Company.

In accordance with the provisions of the Company's 1932 Act, which authorized the acquisition of the Sevenoaks and Tonbridge areas, the price in the Urban District of Tonbridge and a small area immediately adjoining it was not to be more than 8½d., except to the extent to which the price in the Metropolitan area exceeded 9d.; while in other parts of the Tonbridge and Sevenoaks districts the price was not to be more than 1·8d. above the price charged in the Urban District of Tonbridge, and must in no case exceed 16d.

Counsel said there were some costs which the Company could not allocate on a really sound basis, and these had not been taken into consideration in arriving at the proposed differentials.

Matters such as the repair and maintenance of distribution mains, services, meters, and stoves, the wages and salaries of inspectors, meter reading, collection, stationery, superannuation, insurance, &c., were excluded, even though, if they were apportioned, they would weigh more heavily on the outer areas than on the Metropolitan area. For example, a meter reader could cover a given area in the Metropolitan district more quickly than in the outer districts, because the houses were situated more closely together.

It was proposed by the Bill that the existing basic price of 11d. per therm should be reduced to 10¾d., to offset the increased income which would be derived as the result of the differentials in the outer areas, because it was not desired to pay greater dividends as the result of differentials. It was also proposed that the present selling price, which is 9½d. per therm over the greater part of the area of supply, should be reduced to 9¼d. in the Metropolitan area, the differentials in the outer areas being added to that figure.

It was provided that in arriving at the consumers' benefit under the basic price system, on which benefit the dividend authorization was based, the increase of revenue resulting from the payment of differentials in the outer areas was not to be taken into account. There was to be a single basic price applying to the whole area of supply, and that was in accordance with the recommendations of the Joint Committee of both Houses of Parliament which had considered the claims for multiple and single basic prices last year. The Company's Bill was drafted, however, before the Committee's report had been made.

With regard to street lighting, the Bill provided that the charge made for gas for that purpose in any particular area should not be higher than the lowest rate charged to any domestic consumers in that area.

Discussing the petitions against the Bill, the main points of which were the objections to the proposed differentials, Sir Lynden said that in the case of Beckenham U.D.C. it was objected that a small part of the U.D.C. would be within the area for which a differential of ¼d. per therm was proposed. He pointed out that the greater part of the U.D.C. was within the Metropolitan area, and would benefit by a reduction of price under the provisions of the Bill, whereas the small part in the differential area would continue to pay the same price as was charged to-day; there would be a reduction of ¼d. per therm in the Metropolitan area, and a differential of ¼d. in the small part of Beckenham which was outside the Metropolitan area. He emphasized that Bromley, which was in the same position as that small part of Beckenham, was not opposing the Bill.

The petitions urged, he said, that no matter what changes of circumstances had arisen since the various areas were amalgamated, the Company should be tied down to a system of charging which was inappropriate, and which he submitted was unfair and inequitable in its effect on the different classes of consumers. Parliament had since the war revised over and over again arrangements which, by reason of change of conditions, had become inequitable and unjust.

Mr. Thorpe (for the Beckenham U.D.C.) claimed that Parliament had never re-imposed the differential.

Sir Lynden Macassey said he resisted strenuously the contention that Parliament should not revise any arrangement, no matter how circumstances had changed; neither had it adopted the principle that the price of gas should always be the same throughout a local authority area. In this connection he pointed out that in the Local Government Act of 1929 provision was made for the alteration of boundaries of local government areas, but there was no provision for changes of gas, electricity, or water charges.

Another matter raised in the petitions was that the Company should promote another Bill in Parliament before 1935, so that there would be an opportunity given to local authorities to ask Parliament to revise the basic price if necessary. Counsel pointed out that by a previous Act the Company was bound to promote a Bill for that purpose not later than 1935, and the London County Council had accepted the Company's undertaking that the present Bill would not be regarded as rendering a further Bill unnecessary. He did not see why the petitioners should not accept a similar undertaking.

It was urged by Counsel for the petitioners that in those circumstances there should be no objection to the inclusion of a definite obligation in the present Bill; after some argument Sir Lynden agreed to this course, though he repeated that it was unnecessary, as the obligation already existed.

Dr. *C. Carpenter* (Chairman of the South Suburban Company) commenced his evidence on March 7, and this part of it was mainly of an historical nature. He dealt with the arrangements made between the South Suburban and the South Metropolitan Gas Companies to effect co-operation and economies.

Wednesday, March 8.

Dr. *Carpenter*, resuming his evidence, said that the necessity for the differentials proposed in the Bill had arisen because the Company's capital expenditure per therm supplied was increasing, instead of reducing as it should do. In searching for the cause the Company had come face to face with the difficulties as regards the development of the outer areas. In the Metropolitan area there was not the increased consumption that could reasonably be expected, and he believed the main reason was that the price of gas there was higher than it should be. The Company could not work at a loss, but must work for a carry-forward within the limits laid down by Parliament. A higher price than would otherwise be necessary had to be charged in the Metropolitan area to compensate for the loss in the other areas, because under present powers the price over the bulk of the outer areas had to be the same as in the Metropolitan area. Indeed, he referred to the price charged in the Metropolitan area as unfair; it was unfair to the consumers, and as a result it handicapped the business.

The Chairman asked whether it would be proper to make differential charges in the outer areas if they developed eventually as much as the inner areas.

Dr. *Carpenter* said it all depended on the capital outlay necessary to provide the service, for the return on that capital had to be provided for all time. One of the troubles in the Company's area was that the points of development were so far apart that one did not help the other. He agreed with Counsel that if the development in the outer areas proceeded as had been contemplated in 1912 (when a large part of the area was acquired by amalgamation)—*i.e.*, with blocks of houses built close together—then development would in the course of time reduce the costs of supply in the outer areas to something like those in the Metropolitan area; but if development proceeded as now on the basis of 12 houses to the acre, the increased costs of distribution, based on capital expenditure, must be permanent.

After Dr. Carpenter had emphasized that the proposals of the Bill were not intended to increase dividends by a farthing, Counsel asked why the Company was promoting a Bill, at its own expense, in order to benefit consumers. His reply to that was that competition was becoming more and more keen, mainly from State-aided electricity, and it affected the Company most in the inner areas. Unless a proper charge could be made in the Metropolitan area the Company was likely to suffer from the competition of electricity.

In 1930 the price of gas was raised from 9d. to 9½d. per therm; though there was nothing to necessitate an increase in the Metropolitan area, the price had to be increased there because the Company was bound to charge a uniform price over a large area, which included the Metropolitan area. If the Company could have allocated the charges fairly, probably it would not have increased the price in the Metropolitan area.

The figures in the Bill, and the zones proposed, were adopted on the advice of the most qualified experts in gas engineering and accountancy.

Asked if it were the intention to reduce the price in the Metropolitan area, he said that the Bill would not have been promoted otherwise. The proposed prices were calculated so that the decrease in the Metropolitan area and the increase in the outer areas would balance revenue as nearly as possible.

If the price in the Metropolitan area were reduced to 9¼d. per therm, as proposed, and the basic price remained at the present figure of 11d., the consumers' benefit, and consequently the dividend authorized, would be increased; therefore, it was proposed to reduce the basic price to 10¾d.—*i.e.*, by the same amount as the selling price in the Metropolitan area would be reduced.

With regard to the price for lighting, the provision which had applied to the Company since 1893 was that the price charged should not be higher than the lowest charge made to any *private* consumers. It was proposed to repeal this, and to substitute a clause providing for a price not higher than the lowest charge to any *domestic* consumer. Dr. Carpenter pointed out that in 1893 there were not the big industrial demands that exist to-day, and it was not right that the price for public lighting should be governed by the price to large industrial consumers. An industrial supply was usually a large supply through one main, for six days a week throughout the year; the lighting load fell off severely during the summer months, and the Company could not afford to supply at the industrial rates for lighting. The price for public lighting was really governed by electrical competition.

Cross-Examination.

Mr. F. G. Thomas, C.M.G., K.C. (cross-examining on behalf of the Northfleet and Swanscombe Urban District Councils, whose areas are in the extreme north-east of the Company's territory), said that when the Company was before Parliament to secure the application of the basic price system one of the circumstances, and a not unimportant one, mentioned was that the Company was charging a uniform rate throughout its area, except for a small part.

Dr. *Carpenter* replied that he had no doubt it was put before Parliament; he did not agree, however, that it was important.

Mr. Thomas urged that it was a matter to be considered by Parliament.

Dr. *Carpenter* replied that it simplified the matter then.

Mr. Thomas then went on to point out that when the Company had amalgamated with the Northfleet Company it had proposed a permanent differential charge of 3d. per therm in that Company's original area, but the Northfleet Council had petitioned against the Bill, urging that the differential should diminish and ultimately disappear. The Company had agreed to that, and so had avoided the Council's opposition, and the Bill was unopposed.

Dr. *Carpenter* said that the concession had outweighed the disadvantages of disagreement with the local authority.

Mr. Thomas said the Company now proposed to tear up that agreement and impose a permanent differential in the district.

Dr. *Carpenter* reminded Counsel that the substantial reduction of 4d. per therm was made in the price of gas in Northfleet at that time; it had found that it had given more than it should have done, and it was asking for a little of that back.

Mr. Thomas said that obviously the amalgamation was effected because it was thought to be in the interests of the Company. Only four years later it was proposed to apply a permanent differential, and the Council's hope of securing uni-

form charges—the very thing it had been prepared to go to Parliament for in 1929—was defeated. He asked if it were suggested that there were changes of circumstances since 1929.

Dr. *Carpenter* replied that this was not suggested in regard to Northfleet, which was a very poor town from the gas supply point of view; it seemed to be still very much the same as it was 50 years ago. It had to-day an infinitely better supply of gas, both in quantity and quality, than it had at the time of amalgamation.

Mr. THOMAS asked if witness would agree that uniform charging was a good thing.

Dr. *Carpenter* replied that he had never said so, and he certainly did not agree.

Mr. THOMAS suggested that that view might be contrary to the principles which guided other authorities in the Gas Industry.

Dr. *Carpenter* said he did not know that, but after more than fifty years' experience he put forward his proposal as the ideal for gas supply in the Company's area or any similar area.

Reference was then made by Mr. Thomas to an address to the Tottenham Company by its Chairman, Mr. Henry Woodall. Mr. Thomas said that that Company was supplying in rural areas of Hertfordshire, so that it had the same problems as the South Suburban Company, but it took the view that a permanent differential would be a danger to the Industry and the Company's prosperity. Dr. Carpenter replied that if that were so he differed from the Tottenham Company.

After an objection with regard to this reference to the Tottenham Company, which, it was urged, constituted evidence, the matter was not pursued further.

Mr. THOMAS asked if the differentials in the outer areas would discourage the use of gas.

Dr. *Carpenter* replied that those areas could not do without gas, but in the Metropolitan area there were alternative supplies of electricity and oil, so that there was greater freedom of choice.

Mr. THOMAS: And that is why you want to penalize the people in the outer areas by imposing those charges?

Dr. *Carpenter:* I do not seek to penalize them; I seek to charge a fair price for the delivery of the article they desire.

When it was suggested that the Company looked to the outer areas for the main expansion in the future, and that the increased consumption there had been the main factor in building up the load, Dr. Carpenter disagreed, and said he did not think there was hope of very great expansion. Last year, he said, those areas had developed at an almost feverish rate, and yet there was a decrease of ½% in the quantity of gas supplied over the whole of the Company's area.

Mr. THOMAS said that if the differentials injured the development of the use of gas the outer areas would pay twice over, because they would pay differentials and would also pay higher charges for gas than would be necessary if gas were more largely used.

Dr. *Carpenter* replied that the Company's object all the time was to reduce the price of gas to the consumer.

Mr. F. J. WROTTESLEY, K.C. (cross-examining on behalf of the Sidcup U.D.C. and the Bromley R.D.C.), said that the Bromley R.D.C. area had doubled its population since the South Suburban Company had amalgamated with the old Bromley Company in 1912, so that it was a desirable area for a gas company to get hold of.

Dr. *Carpenter* agreed, except in regard to its distance from the place at which the gas was manufactured.

Mr. WROTTESLEY replied that that was the fault of the Company, who had persuaded Parliament in 1912 that the amalgamation would be advantageous from the point of view of the supply of gas. When the Bromley and Crays Companies had amalgamated, in 1908, Parliament had decided that the charges in Bromley and Crays should be uniform; and when they were amalgamated with the South Suburban Company in 1912, the latter had said that the arrangement would be adhered to.

Dr. *Carpenter* replied that the history of the matter did not weigh with him so much as the justice of it.

Mr. WROTTESLEY complained that the present Bill proposed to make differential charges in the area in which Parliament had said, in 1908, prices should be uniform. One of the principal bases of justice, he urged, was the keeping of contracts.

Dr. *Carpenter* said that was so, provided circumstances had not changed.

Figures relating to the quantities of gas supplied were obtained by Mr. Wrottesley, which showed, he said, that whereas in 1914 there was a greater sale of gas within the Metropolitan area than outside it, in 1932 the position was entirely reversed, though, of course, allowance must be made for the extension of the area of supply since 1914.

The CHAIRMAN said he wanted to know the consumption per mile of main.

Sir LYNDEN MACASSEY, K.C. (for the Company), added that the mileage of mains required to give the supply in the outer areas was out of all proportion to the mileage in the Metropolitan area.

Mr. WROTTESLEY asked if Dr. Carpenter considered that the series of amalgamations effected by the Company was a mistake.

Dr. *Carpenter* replied that he had to take these amalgamations as they were and make the best of them.

Mr. WROTTESLEY: Do you think they are a mistake?

Dr. *Carpenter:* I do not know.

Replying to further questions, he said that the absence of differentials in the Company's area was quite wrong.

The CHAIRMAN, bearing in mind that the Company had to promote a Bill not later than 1935, to give an opportunity for revision of the basic price if necessary, asked if the question as to whether the differentials, if allowed, were still just would also be considered.

Dr. *Carpenter* replied that the basic price would be re-considered, but he did not imagine that the differentials would be, because what would be fair to-day would in all probability be right five or ten years hence.

When Mr. Wrottesley remarked that the Company's last dividend, of 6%, was not bad in these hard times, especially when contrasted with railway dividends, Dr. Carpenter said that if the promoters of the electrical grid had their way the gas undertakers would be in the same position as the railways. In the words of the Chairman of one of the electricity undertakings, every nerve was strained to "stamp out" gas; in those circumstances, 6% was not in any sense unfair or even liberal.

Mr. WROTTESLEY said he appreciated that the Gas Industry was one of the most efficient, and he supposed that Dr. Carpenter was not afraid of even the Government's report on electricity.

Dr. *Carpenter* said that sometimes it kept him awake at night.

Questions were then asked by Mr. Wrottesley as to whether the power sought to charge differentials was permissible or compulsory, and whether it was the intention to impose the differentials at once, if granted, and permanently. Dr. Carpenter said he could not anticipate what the future would require. The Company hoped to charge the differentials, otherwise it would not have the money in the till to enable it to do what it ought to do in the Metropolitan area. But the prices charged must depend on the development of the business.

The CHAIRMAN asked if the Company would undertake not to reduce the price anywhere until the differentials were taken off.

Dr. *Carpenter* replied that that would be against the object of the Bill, which was to enable a reduction of price to be made in the Metropolitan area.

Mr. WROTTESLEY, commenting on a reply made by Dr. Carpenter, to the effect that the outer areas were suffering from their geographical position, said that when there was money to spare it would not be used to bring down the differentials.

Dr. *Carpenter* agreed.

Mr. WROTTESLEY then put forward the suggestion that by reducing the price over the whole of the Company's area by 0·15d. per therm below the existing price of 9½d.—*i.e.*, to 9·35d.—the sale of gas might be improved; at that figure the authorized dividend would be nearly 6½%, and, judging by last year's accounts, the Company could probably earn it. He asked if that were not statesmanlike.

Dr. *Carpenter* considered that it would be most unstatesmanlike.

When the matter was pressed further, and he was asked if an increase of price in the outer areas would render it more likely that a person buying a new house, without gas pipes fitted, would have them fitted, bearing in mind that electricity was available, Dr. Carpenter answered by asking if it were thought that he was so unbusinesslike as to put forward proposals to damn his reputation and injure the business of the Company. He did not think there was substantial risk.

Another matter emphasized by Mr. Wrottesley was that Section 11 of the Gas-Works (Clauses) Act, 1871, which applied to the Company, gave the right to require a prospective consumer to undertake to use gas for two years and to pay not less than 20% of the capital cost incurred in providing that supply. It was urged that the purpose of that was to prevent undue costs of supplying some consumers having to be borne by others, yet the Company had not used that power. Dr. Carpenter's reply was that the Company would not get new consumers if it applied that power; there were powers under the 1871 Act which were not an atom of use in present circumstances.

It was suggested that the Company would be tempted to use the extra revenue derived from the differentials to increase dividends, but Dr. Carpenter pointed out that the Company had to promote a Bill to give Parliament an opportunity to revise the basic price by 1935, and if the Company paid unreasonable dividends Parliament would make an alteration then.

Mr. WROTTESLEY, after remarking that the differential powers were not required to enhance the Company's credit, which was admirable, and that its 6% stock had a value of £125 per £100, asked if the London County Council or any other local authority interested in the Metropolitan area had suggested the promotion of the Bill, and whether anyone in that area complained that the cost of gas was unfair.

Dr. *Carpenter* replied in the negative, but pointed out that the Company had had in mind the reports made by the persons who were in daily contact with the consumers in the area. In his opinion the London County Council should have asked the Company to promote the Bill.

Mr. S. G. TURNER, K.C. (for the Bexley, Erith, and Crayford Urban District Councils), quoted figures to show that those areas had developed considerably during the last ten years, and suggested that they would continue to develop, whereas the Metropolitan area was already built up, so that the increased consumption would continue in the outer areas.

Dr. *Carpenter* replied that that was not wholly true. If the price of gas could be reduced in the Metropolitan area gas would be used for purposes for which it is not used to-day. There was a large potential water-heating load, and lower price would enable gas to compete more effectively with electricity and oil for this purpose.

Mr. TURNER said that the sale in that area was 10·3 millions in 1928 and 10·4 millions in 1932, so that it was practically stationary, and he suggested it would remain so.

Dr. *Carpenter* hoped not. He had in mind not only the possible increase of the use of gas, but also that people might give up the use of gas if they found it too costly in competition with electricity, and he wanted to avoid that.

Mr. F. N. KEEN (cross-examining on behalf of the Dartford R.D.C.) complained that under the proposals of the Bill the

different parishes in the rural district would have to pay different prices, whereas now they were on an equality with each other and with the Metropolitan area.

Dr. *Carpenter* replied that in the past they had had a little more than they should have done.

Mr. J. H. THORPE (for the Beckenham U.D.C.) put questions concerning what he regarded as an injustice, in the proposal to charge a higher price in the Shortlands ward of Beckenham (which was about one-ninth of the whole) than the remainder of the urban district.

Dr. *Carpenter* did not consider it an injustice. In the course of his answers he pointed out that the Shortlands ward was within the area of the Bromley Company before amalgamation, and the gas supplied there was made at the Bromley Works; the mains were substantially the same as existed at the time of the amalgamation.

[Our report of Thursday's sitting is held over, and at the close of the proceedings on that day the Committee adjourned till to-day.]

Gas Companies' Results in 1932

Alnwick.

The Secretary (Councillor C. Turnbull) reported to the Annual Meeting of Alnwick Gas Company that there was a decrease of 2% in the sales of gas. They had done well with residuals, especially with tar. There had been an increase of 100% in the number of new cookers. A dividend of 6% per annum, making, with the interim, 4¾% for the year on the consolidated stock and 6% for the year on the preference stock, was approved.

Altrincham.

The Annual General Meeting of the Altrincham Gas Company was held at the Company's Office, Cross Street. In the absence of the Chairman of Directors (Mr. W. W. Baker), the meeting was presided over by Mr. C. H. Syers (Deputy-Chairman). The profit shown by the revenue account is £16,300. The balance shown by the profit and loss account as available for dividend is £6601, which will provide for payment of the full statutory dividends, less income-tax, and leave a balance of £2784 to be carried forward. The quantity of gas sold shows an increase of 14,328,800 c.ft., as compared with the previous year. As from the June reading of the meters to the end of the year the price of gas was reduced by 2½d. per 1000 c.ft., or ½d. per therm. During the year the Directors applied for, and were successful in obtaining, authority under Section 1 of the Gas Undertakings Act, 1929, to increase the borrowing powers of the Company. A dividend of 4¾% on the original shares and 3½% on the new shares has been paid, making, with the interim dividend paid in August, 1932, 9¼% and 7% respectively for the year.

Barnet.

The sales of gas by the Barnet District Gas and Water Company show an increase in quantity of 2·73% over the previous year, and the water revenue also shows an increase of 2·7%. After placing to renewals (gas and water) funds the authorized contributions, the payment of debenture and other interest, and an interim dividend for the half-year at the authorized rate of 7% per annum, and the placing of £2500 to general reserve, there remains a balance of available profit of £52,353. The Directors recommended the declaration of a dividend, less income-tax, for the half-year ended Dec. 31 last at the rate of 7% per annum on the ordinary stock, leaving to be carried forward a sum of £32,835.

Barnstaple.

Mr. F. W. Hunt, J.P., C.A. (Chairman of Directors), presided at the Annual Meeting of the Barnstaple Gas Company. Moving the adoption of the report and accounts, the Chairman said: The revenue account shows that the income for gas was £17,746, compared with £17,623 in 1931, a gain of £123. Rental from meters, stoves, and fittings increased from £2662 to £2743, and the revenue from residuals was £4333, as against £4607, the total revenue for the year being £24,978, against £25,020 for 1931. On the expenditure side of the account, manufacture of gas cost £14,479, against £16,239; distribution charges were £4357, against £2583; rates, taxes, and insurance, £1063, against £1181; management, £1351, against £1398; the total expenditure amounting to £21,260, as compared with £21,404 in 1931; the amount carried to profit and loss (net revenue) account being £3717, as against £3615. After meeting the charges for mortgage interest and income-tax, and transferring the sum of £233 to reserve fund account, the balance standing to the credit of profit and loss account is £6663, out of which the Directors recommend the payment of dividends for the year at the rates of £13% per annum on the "A" shares, and £9 2s.% per annum on the "B" shares, both less income-tax. This will absorb £2020, and leave £4643 to be carried forward. The reserve fund account shows a balance of £3545, of which £2331 is invested in conversion stock. During the year we carbonized 6449 tons of coal, and made 92,505,000 c.ft. of gas; 3708 tons of coke; 67,701 gallons of tar; and 25 tons of sulphate of ammonia. The working results of the undertaking are very satisfactory indeed, and reflect a good deal of credit on the management.

Eastbourne.

Mr. Frank H. Jones (Chairman of Directors) presided at the Annual General Meeting of the Eastbourne Company. The annual report on the year's working, presented to the proprietors, showed that the sales of gas for the year 1932 were 2,993,201 therms, or 4·93% less than in 1931, due, to a great extent, to the exceptional mildness of the weather, and the general financial depression. After payment, in September last, of interim dividends at full statutory rates (less income-tax) in respect of the half-year ended June 30, 1932, and providing for interest charges, &c., there is a balance of £10,434 at the credit of the profit and loss account. The Directors recommended the declaration of dividends for the half-year ended Dec. 31, 1932 (being final dividends for the year), at the same rates all less income-tax—viz.: On the "A" stock at the rate of £8 10s.% per annum; on the "B" stock at the rate of £7% per annum; and on the 5% preference stock at the rate of £5% per annum. These dividends will absorb the sum of £9771, and leave a balance of £663 to be carried forward. The Cookery Demonstration Theatre, which has been erected on freehold land belonging to the Company, at the rear of the Offices and Showrooms, is stated to have already proved of great advantage to the Company.

Hexham.

The Hexham Gas Company report a gross profit of £3495. A dividend of 3½%, less income-tax, on the ordinary stock is proposed, making, with the interim dividend, 6% for the year. The new issue of ordinary stock ranks for dividend as from Sept. 30 at the rate of 6% per annum.

Leatherhead.

During the year the sale of gas by the Leatherhead Gas and Lighting Company increased by 2½%. In November last the Directors issued £5000 of 4% debenture stock at par. The accounts show that, after deducting the dividends paid in September, and providing for all fixed charges and interest, there remains for division a balance of £5575. The Directors recommended the payment of dividends for the second half-year as follows: On the preference stock, 3%, making a total of 6% for the year; on the redeemable preference stock, 3¼%, making a total of 6½% for the year; and on the ordinary shares, 4½%, making, with the interim dividend of 2½%, a total of 7% for the year. These dividends (less tax) will absorb £4365, and leave £1210 to be carried forward to the next account. Early in the year the Company suffered a grievous loss in the death of Sir Arthur Duckham, who was recognized as one of the outstanding leaders in the Gas Industry. Mr. F. B. Richards, who accepted an invitation from the Directors to fill the vacant seat, is a well-known engineer, whose practical experience will be of much value to the Company.

Long Eaton.

The Long Eaton Gas Company report an increase in the sales of gas and 395 new consumers have been obtained. The terminable mortgages falling due for repayment on June 24 last have been duly cancelled, and a new issue of 5% (less tax) perpetual debenture stock has been issued at par. Most of this stock was taken up by the holders of mortgages. After payment of the year's interest on loans, the year's interest on the preference shares and provision for depreciation, the balance of net revenue account is £15,352. The Directors recommended: Confirmation of interim dividends of 2½% (actual) on the "A" stock and 2% (actual) on the "B" stock paid Aug. 1, 1932, less tax; payment of final dividends at the same rate as last year—viz.: 6% (actual) on the "A" stock and 5% (actual) on the "B" stock, making for the year a total of 8½% and 7% respectively, less income-tax; an addition of £2000 to the reserve fund; and the carrying forward of the remaining balance of £7682 (subject to the ascertained allocation to the co-partnership fund).

Malton.

The Directors of the Malton Gas Company submitted accounts for the past half-year which showed that the expenditure in the revenue account has amounted to £7814, and the receipts to £9717. The profit is less, compared with the corresponding period of 1931, by £288. This decrease has been caused chiefly by the reduction in the price of gas during the last three months of the year and additional expenditure in respect of meters and cookers for new houses. The reduction of ½d. per therm, made last October, means a saving to the consumers in a full year of £800. The consumption of coal has been less, although the gas consumption is more by 3211 therms, or 642,000 c.ft., than for the same period twelve months ago. The receipts from coke and asphalting have been less, but tar and fittings are more. With the balance of £5621 brought forward from the last accounts, there is a balance, after paying income-tax and interest on mortgage bonds, of £7113. The Directors recommended that £6 2s. 6d.%, free of income-tax, be paid for the half-year.

This will absorb £1470, and leave £5643 to be carried forward to the next accounts.

Matlock.

The revenue account of the Matlock and District Gas Company showed a profit of £4324. To this has to be added the unappropriated balance from the previous year, £19,291, making together £23,616. Against this has to be charged the interim dividend (less tax) paid in August last, amounting to £1009, and debenture interest for the year, amounting to £390, leaving for disposal £22,217. This sum the Directors recommended should be applied in the following manner—viz.: By paying a dividend for the half-year ended Dec. 31, 1932, at the rate of 12s. per share on the paid-up capital of the Company (making 8½% for the year, less tax), and by carrying forward to the current year the balance of £19,795.

Narborough, &c.

The working results of the Narborough, Blaby, Enderby, and Whetstone Gas-Light and Coke Company, Ltd., are all that can be desired both regarding the manufacture and distribution of gas. The number of consumers has been increased by 109 during the period, and the works and plant kept in a good state of repair. At the present time considerable work is taking place in extending the area of supply to an adjoining village, Cosby. Mains have been completed and a sufficient number of applications has already been dealt with as to make the venture successful. The Directors recommended a final dividend of 2s. 6d. per share on the ordinary shares, making, with the interim dividend paid during August last, 10% per annum, together with a bonus of 2s. 6d. per share, both less tax; they transfer £1000 to the renewals fund, leaving to be carried forward the sum of £8587.

Newmarket.

The report of the Directors of the Newmarket Gas Company, presented at the Thirty-Ninth Ordinary General Meeting held at the Company's Office, on Feb. 27, showed that the balance brought forward from last year is £6797, less debenture interest paid for the year 1932 of £162, leaving £6635. The profit earned during the year ended Dec. 31, 1932, is £6371, making a balance at the credit of profit and loss account of £13,006. The Directors recommended that out of this amount a dividend be paid at the rate of 8¾% for the year 1932 upon the £65,000 original consolidated stock of the Company, less income-tax, leaving to be carried to next year's account the sum of £8741.

North Middlesex.

The sales of gas by the North Middlesex Gas Company for the year show an increase of 1·02%, compared with that for the preceding year. The profit for the year (including interest received) after charging interest on debenture stock and temporary loans, income-tax, &c., and transferring the sum of £2000 to the contributory pensions fund, amounts to £24,999, which, with £6921 brought from the previous year, makes the disposable balance £31,920. Interim dividends on account of the year ended Dec. 31, 1932, declared by the Directors, were paid on Sept. 2 last at the following rates—viz.: On the 5% preference stock, £5% per annum; on the 6% preference stock, £6% per annum; and on the standard consolidated stock, £7 10s.% per annum (less income-tax), and the Directors recommended the declaration of final dividends for the year ended Dec. 31, 1932, at the same rates (less income-tax), and that £2749 be transferred to the reserve fund. These appropriations (including the interim dividends) amount to £24,576, leaving £7344 to be carried forward to the credit of the profit and loss account for the current year. Modern and commodious showrooms and offices have been erected at Church End, Finchley, which afford much improved facilities to the Company's consumers in the district.

Oxford.

The Annual General Meeting of the Oxford and District Gas Company took place in the Board Room, "York House," St. Aldates, Oxford, on March 1, when Mr. H. J. Bradley, J.P., the Chairman of the Company, presided. The Chairman said: Your Directors have been pleased to reward the excellent work of Mr. Caton as General Manager and Engineer for the past 16 years by electing him to a seat on the Board. Mr. Caton is a gas engineer of the highest rank. He is a Chartered Civil Engineer, a Chartered Mechanical Engineer, and a Chartered Gas Engineer. He is unsparing in his devotion to the interests of the Company. Since he came here he has not only modernized the old works, but has been responsible for the layout, building, and working of an entirely new gas-works, capable of doubling its present capacity when required. Since Mr Caton came to Oxford the sale of gas has increased from 350 million c.ft. per annum to over 1000 millions. The area of supply has been extended from 25 square miles in 1916 to 120 square miles to-day. The number of consumers has been doubled, and the length of our mains increased from 80 miles to 199 miles. Expenditure on the manufacture of gas has decreased by approximately £10,000, although the gas sold has increased by 13 million c.ft., or 1½%. This saving is due to the introduction of the carburetted water gas plant, and these accounts show the first full year's operation of this plant. We have carbonized approximately 10,000 tons less coal during 1932, but have used 87,000 gallons more oil. On the other side of the account gas rental shows an increase of about £3000, and rental of meters, stoves, and fittings of about £1000. The return for residual products shows a decline of just over £5000. The net result of the year's trading as shown by the account is a profit of £52,871. Mr. Caton said the make of gas per ton of coal had been well maintained, and the net cost of fuel per therm sold—*i.e.*, fuel, less receipts for coke, tar, &c.—is less than in 1931. During the year, he said, we have added 1756 new consumers, as compared with 1616 during 1931. The number of additional cookers on hire and sold outright, together with fires, radiators, water heaters, &c., have increased by 2765, as compared with 2793 in 1931, and public lamps have increased by 142, as compared with 140 the previous year. The Chairman then proposed that in respect of the half-year ended Dec. 31, 1932, dividends be declared at the following rates per annum, subject to deduction of income-tax—namely, 5% on the preference stock, 6% on the redeemable preference stock, and 10% on the consolidated ordinary stock of the Company, making, with the interim dividends at the same rates respectively, 5%, 6%, and 10% for the whole year on the three classes of stock respectively.

Pudsey.

The sales of gas by the Pudsey Gas Company show a slight increase when compared with the previous year. The balance of net profit, after deducting the interim dividend at the rate of 9% per annum, amounts to the sum of £12,748, from which the Directors recommended the proprietors to declare a dividend for the past half-year at the rate of 9% per annum.

Reading.

Owing to the industrial depression and the exceptionally mild weather during the winter quarters the sales of gas by the Reading Gas Company show a small decrease of 0·43% on the sales for 1931. During the year over 1000 new consumers have been supplied, while the number of gas appliances sold and let on hire and the revenue from residual products show satisfactory increases. Good progress has been made with the third vertical retort installation. An issue of £60,000 5% redeemable preference stock (redeemable July 1, 1960) made in May at a minimum price of 98% to meet the cost of the vertical retort installation was over-subscribed nearly six times, the average price realized being £100 10s.%. Interim dividends at the statutory rates for the six months ended June 30, 1932, were paid on Sept. 1, 1932, and the Directors recommended that dividends, at similar rates for the half-year ended Dec. 31, 1932, be paid on March 1, less income-tax. Mr. J. C. Blandy (Chairman of Directors) presided at the Annual Meeting.

Romford.

Over 600 million c.ft. of gas were manufactured by the Romford Gas Company during the year, and the sale exceeded that of the preceding year by more than 46 millions—8·59%. During the course of the past twelve months 2303 additional consumers have been connected to the Company's mains, and 2311 appliances fixed up for use on consumers' premises. The price of gas was reduced in July last, and a further reduction of 1½d. per 1000 c.ft. has now been announced to apply as from the reading of the meters for the Christmas quarter, 1932. To provide for the redemption of £40,705 6% redeemable preference stock and to meet expenditure on new works, mains, &c., additional capital has been raised by the issue of £25,000 5% perpetual debenture stock at par, and also £60,000 4% redeemable preference stock, which was allotted at prices ranging from £102½-£105 per £100 stock. In accordance with the provisions of the Romford Gas Act, 1929, the sum of £2947 has been applied out of the profits for the year for the benefit of the employees. The Directors have established a scheme, the primary object of which is to provide a pension for employees upon retirement from the Company's service at the age of 65; provision has also been made whereby each member of the scheme is covered for £100 under a Group Life Assurance Policy. The Directors recommended the payment of the following dividends, less income-tax: On the ordinary stock at the rate of 6¾% per annum; on the 6% redeemable preference stock at the rate of 6% per annum; and on the 5½% preference stock at the rate of 5½% per annum, less the interim dividends already paid, less tax, to June 30, 1932, at the following rates per annum: 6½% on the ordinary stock, 6% on the 6% redeemable preference stock, and 5½% on the 5½% preference stock. There will remain a sum of £7536 to be carried forward.

Shotley Bridge.

Mr. J. M. Nicholson (Deputy-Chairman) presided at the Annual Meeting of the Shotley Bridge and Consett District Gas Company. The amount brought forward was £543, and the total income was £6010. After payment of interest on mortgages, loans, and the 5½% debenture stock, and interim dividends, there remained £807. A dividend of 5% on the consolidated stock was declared and 6½% on the redeemable preference stock. The profits were £281 less than last year.

Southgate.

The sales of gas for the year by the Southgate and District Gas Company show a decrease of 1·75% compared with that for the preceding year. After providing for interest, income-tax, &c., and transferring £2000 to the contributory pensions fund and £1000 to the reserve fund, the balance of profit available for distribution is £20,395, from which interim dividends on account of the year ended Dec. 31, 1932, were paid on Sept. 2, 1932, at the following rates—viz.: On the preference stock, £5% per annum; and on the consolidated 7% maximum stock, £7% per annum (both less income-tax); and the Directors recom-

mended the declaration of final dividends for the year ended Dec. 31, 1932 (less income-tax), at the same rates. This distribution (including the interim dividends) amounts to £10,767, leaving £9627 to the credit of the profit and loss account to be carried forward to the current year. The price of gas was reduced by 0·2d. per therm as from Oct. 1 last. In addition to this benefit to the consumers, meter rents have been reduced, and fires and cookers purchased are now fixed free of charge with the object of encouraging the further use of gas.

Stamford.

The Annual Meeting of the Stamford Gas Company was presided over by Mr. Edward Dalton. The net profit on the year's working was £3357, and that, on the profit and loss account, after payment of interest on mortgage, interim dividends, &c., there was a balance of £4946 available for disposal. The Directors recommended a confirmation of the interim dividend of 6% paid in September; the payment of a final dividend of 7%; and the carrying forward of £4120. Mr. Dalton mentioned that there had been a slight fall in the revenue from the sales of gas, due entirely to a drop in industrial sales, but, on the other hand, the consumption for domestic purposes had increased. Moreover, the sales of appliances, &c., had been a record. They had been able to reduce the price once again by ½d. per therm.

Sunderland.

At the Annual Meeting of the Sunderland Gas Company, the Chairman (Mr. T. S. Short) said that as the application to the Board of Trade for a Gas Order was being opposed by the Corporation and as the Board of Trade had not issued its award, he could not discuss the details, but he pointed out that the price of gas would not be raised if such an Order was made. It would, however, give an incentive to everyone connected with the Company to exercise economy and thus tend to reduce the price to the consumer. The Company was seeking to bring its legislation more into keeping with modern practice and to enlarge present reserves. The profit and loss account of the Company showed that after deducting interim dividend, there is an available balance of £24,294, out of which the Directors recommended the payment of a final dividend of 3% (less income-tax), making 6% for the year, leaving £15,308 to be carried forward. A supply of coke oven gas has been received during the last eleven months of the year which has proved satisfactory.

Tunbridge Wells.

There has been a slight decrease in the sale of gas by the Tunbridge Wells Gas Company, amounting to 0·98%, due to the mild weather experienced during the year, and to the prevalent industrial depression. The installation of additional appliances, numbering 2771, is an excellent indication of the continued progress of the Company. The Directors regret to have to record the death, in August last, of their esteemed colleague, Mr. G. W. Howard, who had been a Director for nine years. To fill the vacancy, they have elected Col. J. Egginton, O.B.E. In April last £30,000 5½% perpetual debenture stock was offered by tender. The issue was largely over-subscribed, and realized an average price of £107 10s. 3d.%. On Dec. 31 the last of the Crowborough redeemable stocks was repaid—viz., £10,870 of 6% debentures. The profit and loss account, after paying an interim dividend at the rates of £7 4s.% per annum on the sliding-scale stock, and 5% per annum on the maximum stock, together with all fixed charges, shows a balance of £35,213, including the amount brought forward, out of which the Directors recommended a dividend at the same rates (less income-tax) for the half-year to Dec. 31, 1932. This will absorb the sum of £6666, leaving £28,546 to be carried forward to the next account.

Wolverhampton.

The gross profit of the Wolverhampton Gas Company for the year is £28,908, the net profit being £19,976. An interim half-year's dividend was paid on Aug. 31, 1932, at the following rates—viz.: £3% on the 6% preference stock; £2½% on the 5% preference stock; and £3½% on the consolidated ordinary stock; and the Directors recommended final dividends at the same rates for the half-year ended Dec. 31, 1932—all less income-tax. They also recommended that the sum of £2826 be placed to the reserve fund, the balance of £115 being carried forward. The continuance of the long period of trade depression has resulted in a decreased output of gas during the year, particularly in the industrial field. It is, however, encouraging that the number of consumers and the sales of all types of gas apparatus continue to expand, and the Directors have every confidence that with the long hoped for return of improved trade conditions, the output of gas will once again show an upward tendency. The works and plant have been maintained in excellent condition, and the new 3 million c.ft. gasholder, brought into use in August last, has proved in every way satisfactory.

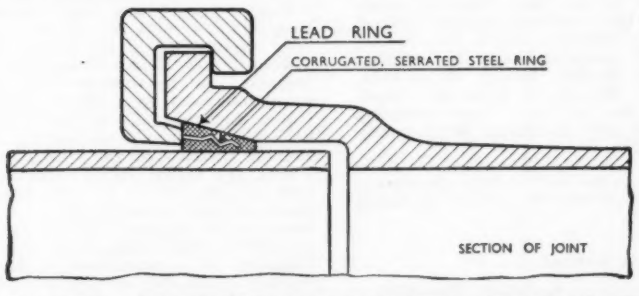
Corporation Undertakings' Results in 1932.

Dundee.

The quantity of gas made amounted to 1,832,650,407 c.ft. of coal and carburetted water gas, compared with 1,887,096,171 c.ft. in 1930-31, a decrease of 54,445,764 c.ft.; the gas sold, inclusive of that used on works, amounted to 1,677,889,400 c.ft., compared with 1,740,111,400 c.ft., a decrease of 62,222,000 c.ft. Gas unaccounted for amounted to 8·44% of the production, compared with 7·78% during the previous year.

The STANTON Mechanical Lead Joint

(Patent applied for)



NO INCREASED COST

This mechanically made joint works on a similar principle to the Stanton-Wilson Joint, but employs a lead ring in which is encased a thin corrugated, serrated steel ring. It is more flexible than a caulked joint and provides for expansion and contraction of mains—No skilled labour needed.

N.B.—Where a considerable degree of flexibility is required, use the Stanton-Wilson self-adjusting Joint, which has been adopted by over 200 Public Undertakings in this country.

The Stanton Ironworks Company Limited, Near Nottingham

GAS MARKETS & MANUFACTURES

Stock Market Report.

[For Stock and Share List, see later page.]

The Stock Exchange weathered the American crisis with surprising equanimity last week, and most markets displayed a firm tendency throughout. Gilt-edged stocks were a trifle dull at one time, though the tone improved towards the close. The absence of any dollar rate considerably reduced business in the foreign exchange market, but it is anticipated that with a re-opening of the New York banks the situation will become more or less normal.

The demand for Gas stocks showed no signs of abating, and with few exceptions prices remained steady. A large number of issues were marked down a point or two *ex* the final dividend, and the only change of note was a drop of 8 points in Imperial Continental ordinary to 202-212. On the other hand, Alliance and Dublin ordinary improved 3 points to 120, and Commercial and South Metropolitan ordinary both gained 1 point to 114½ and 127½ respectively. On the local Exchange, Sheffield consolidated improved 1½ points to 116½, and at the time of writing this price includes a full six months' dividend.

Current Sales of Gas Products.

The London Market for Tar Products.

LONDON, *March* 13.

The prices of tar products are as follows:

With the advance of the shipping season, practically all requirements in pitch have been covered for the present period, and the market is therefore quiet. The price is called 90s. to 92s. 6d. per ton f.o.b., according to period of shipments.

Creosote is 3¼d. to 4d. per gallon f.o.b., according to specification.

Refined tar is about 4¼d. to 4½d. per gallon in bulk at makers' works.

Pure toluole is about 2s. 3d.; pure benzole, about 1s. 11d.; solvent naphtha, 95/160, about 1s. 7d. to 1s. 8d.; and 90/140 pyridine bases, 3s. 6d. to 3s. 9d. per gallon naked at makers' works.

Tar Products in the Provinces.

March 13.

The average prices of gas-works products during the week were: Gas-works tar, 34s. to 39s. Pitch—East Coast, 85s. f.o.b. West Coast—Manchester, Liverpool, Clyde, 85s. f.o.b.* Toluole, naked, North, 1s. 9d. to 1s. 10d. Coal-tar crude naphtha, in bulk, North, 6d. to 6¼d. Solvent naphtha, naked, North, 1s. 5½d. to 1s. 6d. Heavy naphtha, North, 10d. to 11d. Creosote, *ex* works, in bulk, North, liquid and salty, 2½d. to 2¾d.; low gravity, 1¼d.; Scotland, 2¼d. to 2¾d. Heavy oils, in bulk, North, 4¾d. to 5¼d. Carbolic acid, 60's, 2s. 7d. to 2s. 8d. Naphthalene, £9 to £10. Salts, 55s. to 75s., bags included. Anthracene, "A" quality, 2½d. per minimum 40%, purely nominal; "B" quality, unsaleable.

* All prices for pitch are now quoted on the basis of f.o b. In order to arrive at the f.a s. value at any port it will be necessary to deduct the loading costs and the tolls whatever they may be.

Tar Products in Scotland.

GLASGOW, *March* 11.

Inquiries are more numerous, but actual business remains quiet. Values during the week show practically no alteration.

Crude gas-works tar.—The actual value is 45s. to 50s. per ton *ex* works.

Pitch is, if anything, easier in tone at about 82s. 6d. to 85s. per ton f.o.b. Glasgow, but quantities available are small. Home price is 85s. per ton *ex* works in bulk.

Refined tar to Ministry of Transport specification is dull, but makers are maintaining quotations at 3¾d. per gallon f.o.r. naked.

Creosote oil.—There is very little doing in this product. B.E.S.A. Specification is 2½d. to 3d. per gallon; low gravity, 2½d. to 2¾d. per gallon; and neutral oil, 2½d. to 3d. per gallon—all *ex* works in bulk.

Cresylic acid.—Prices remain nominal. Pale, 97/99%, is 10d. to 11d. per gallon; dark, 97/99%, 9d. to 10d. per gallon; and pale, 99/100%, 1s. 1d. to 1s. 2d. per gallon—all f.o.r. in buyers' packages.

Crude naphtha.—Supplies are scarce, and value is steady at 4½d. to 5d. per gallon *ex* works, according to quantity and quality.

Solvent naphtha shows a little improvement. 90/160 grade is 1s. 3d. to 1s. 4d. per gallon, and 90/190 grade 11d. to 1s. per gallon.

Motor benzole.—Available supplies command 1s. 4d. to 1s. 5d. per gallon *ex* works in bulk.

Pyridines.—90/160 grade is 2s. 9d. to 3s. per gallon, and 90/140 grade 3s. to 3s. 3d. per gallon.

Benzole Prices.

These are considered to be the market prices for benzole at the present time.

	s. d.		s. d.	
Crude benzole	0 10½	to	0 11	per gallon at works
Motor ,,	1 6½	,,	1 7	,, ,, ,,
Pure ,,	1 10	,,	1 11	,, ,, ,,

Trade Notes.

Brotherton & Co., Ltd.

This firm have opened a Branch Office at 68, Victoria Street, London, S.W. 1. Capt. Bertram L. Ratcliffe, M.C., a Director of the firm, is in charge.

Contracts Advertised To-Day.

Coke Cutting, Screening, and Grading Plant.

Penrith Urban District Council Gas Department. [p. 705.]

Watford and St. Albans Gas Company.

It was stated, at the Annual Meeting of the Watford and St. Albans Gas Company, at Watford, that it was detrimental to St. Albans to be lighted by electricity and that in allowing it, the City Council were wilfully damaging their own rateable value. The Chairman (Mr. Frank Harding Jones) said that during the year they had £100,000 5½% preference stock and they sold it at £101 18s. It was now quoted at £119. There had been an increase in the output of gas in St. Albans, Elstree, Watford, and Hemel Hempstead. They were increasing the business, and he thought that the coming year would be as prosperous and as good as past years. The annual report stated that the gas supplied in bulk to the Welwyn and Hatfield Gas Company, Ltd., during the year largely accounted for the big increase in gas sales of over 91 million c.ft., equal to 7·92%, the actual increase in their own area of supply being 1·99%. The Order for the acquisition of the Welwyn and Hatfield Gas Company, Ltd., was now awaiting the final approval of Parliament, and an application for an Order for the transfer to the Company of the Harpenden and District Gas Company was shortly being made. The revenue account showed a profit of £56,616, and the profit and loss account (net revenue) a balance of £44,258, after providing for interim dividends and debenture interest and other charges. It was agreed that the payment of dividends be as follows: On the 3% preference stock at the rate of £2 10s.%, less income-tax, making a dividend at the rate of £5% for the year. On the 5½% preference stock at the rate of £2 15s.%, less income-tax, making a dividend at the rate of £5 10s.% for the year. On the ordinary stock at the rate of £3 7s. 6d.%, less income-tax, making a dividend at the rate of £6 15s.% for the year. At an extraordinary general meeting which followed, resolutions to sanction the creation and issue of the share capital of the Company authorized by the Watford and St. Albans Gas Acts and Orders, 1871 and 1931, remaining unissued and to sanction the borrowing on mortgage or the creation and issue of debenture stock of the Company of any sums not exceeding in the whole 60% of the amount of the capital for the time being which at the time of borrowing had been raised, were agreed to.

STOCK AND SHARE LIST.

Official Quotations on the London and Provincial Stock Exchanges.

[For Stock Market Report, see earlier page.]

Issue. £	Share.	When ex-Dividend.	Dividends. Prev. Hf-Yr. % p.a.	Dividends. Last Hf-Yr. % p.a.	NAME.	Quotations. March 11. (Provincial Exchanges March 10.)	Rise or Fall on Week.	Transactions. Lowest and Highest Prices During the Week
1,551,868	Stk.	Oct. 3	7½	7½	Alliance & Dublin Ord. ...	115—125	+3	118½—119
374,000	..	Jan. 9	4	4	Do. 4 p.c. Deb. ...	85—95	...	...
557,655	..	Mar. 6	7	7	Barnet Ord. 7 p.c.	145—150*	−2	148
300,000	1	Oct. 17	1/9⅓	1/4⅓	Bombay, Ltd.	24/6—26/6	...	...
178,280	Stk.	Feb. 20	9½	9½	Bournemouth sliding scale	192—202	...	199
550,050	..	..	7	7	Do. 7 p.c. max. ...	152—162	...	155
439,160	..	..	6	6	Do. 6 p.c. Pref. ...	137—142	...	137—141
50,000	..	Dec. 19	3	3	Do. 3 p.c. Deb. ...	75—80	...	...
162,025	..	..	4	4	Do. 4 p.c. Deb. ...	98—103	...	100
210,000	..	..	5	5	Do. 5 p.c. Deb. ...	120—125	...	123
357,900	..	Mar. 6	7½	7½	Brighton, &c. 6 p.c. Con. ...	141—146*	−2	143
540,000	..	..	6⅔	6⅔	Do. 5 p.c. Con. ...	132—137*	−1	135
195,500	..	..	6	6	Do. 6 p.c. B Pref.	133—143*	−2	138
1,487,500	..	Mar. 6	5	5	Bristol 5 p.c. max.	109—111a*	−2	...
120,420	..	Dec. 19	4	4	Do. 1st 4 p.c. Deb. ...	99—101a	...	...
217,870	..	..	4	4	Do. 2nd 4 p.c. Deb. ...	97—99a	...	...
328,790	..	..	5	5	Do. 5 p.c. Deb.	120—124a	...	...
855,000	..	Oct. 3	8	7	British Ord.	145—150	...	...
100,000	..	Dec. 19	7	7	Do. 7 p.c. Pref.	140—150	...	...
350,000	..	..	—	5⅓	Do. 5⅓ p.c. Pref. ...	105—110	...	...
120,000	..	..	4	4	Do. 4 p.c. Red. Deb. ...	95—100	...	...
450,000	..	..	5	5	Do. 5 p.c. Red. Deb. ...	105—115	...	...
160,000	..	Jan. 9	5	5	Cambridge 5 p.c. Deb. ...	117—122	..	...
100,000	10	Dec. 5	6	6	Cape Town, Ltd.	7⅞—8½	...	...
100,000	10	Nov. 7	4½	4½	Do. 4½ p.c. Pref. ...	6—7	...	6⅞—6¹³⁄₁₆
150,000	Stk.	Dec. 19	4½	4½	Do. 4½ p.c. Deb. ...	88—98	...	...
626,860	..	Feb. 20	6	6	Cardiff Con. Ord.	108—113	...	...
237,860	..	Jan. 9	2½	5	Do. 5 p.c. Red. Deb.	105—110	...	...
157,150	..	Feb. 20	5	6½	Chester 5 p.c. Ord.	93—98b	...	...
98,936	1	Oct. 17	2/-	2/-	Colombo, Ltd. Ord.... ...	25/— 30/-	...	...
24,500	1	Oct. 17	1/4⅓	1/4⅓	Do. 7 p.c. Pref. ...	19/- - 21/-	...	...
609,204	1	Oct. 17	/10 90	/11 47	Colonial Gas Assn. Ltd. Ord.	16/—18/-	...	...
296,053	1	..	1/2 54	1/3 30	Do. 8 p.c. Pref.	19/6 - 21/6	...	...
1,796,955	Stk.	Feb. 20	5	6½	Commercial Ord.	112 - 117	+1	115—116½
475,000	..	Dec. 19	3	3	Do. 3 p.c. Deb. ...	75 - 80	...	...
265,272	..	Mar. 6	—	5	Do. 5 p.c. Deb. ...	118 - 123*	...	122—122½
807,560	..	Feb. 20	7	7	Croydon sliding scale ...	143 - 148	...	145½—147½
463,590	..	..	5	5	Do. max. div.	100 - 105	...	...
500,000	..	Jan. 9	5	5	Do. 5 p.c. Deb.	117—122	...	...
542,270	..	Mar. 6	7	10	Derby Con.	150—160c*	...	...
55,000	..	Jan. 9	4	4	Do. 4 p.c. Deb.	80—85c	...	...
209,000	..	Mar. 6	5	5	East Hull Ord. 5 p.c. ...	100—105*	−2	...
179,500	..	Mar. 6	6	6	East Surrey Ord. 5 p.c. ...	118—123*	−2	...
155,019	..	Dec. 19	5	5	Do. 5 p.c. Deb. ...	117—122	...	...
1,002,180	..	Sept. 19	†6½	†5	European, Ltd.	133—138	...	133—136
19,373,992	..	Feb. 20	5⅝	5⅝	Gas Light & Coke 4 p.c. Ord.	25/— 26/-f	...	25/7½—26/-
2,600,000	..	..	8½	8½	Do. 8½ p.c. max. ...	82 - 87	...	85⅝—86⅝
4,477,106	..	..	4	4	Do. 4 p.c. Con. Pref. ...	100 - 103	...	101½—102
6,102,497	..	Dec. 19	3	3	Do. 3 p.c. Con. Deb. ...	79 - 83	...	81—82½
3,642,770	..	..	5	5	Do. 5 p.c. Red. Deb. ...	114—118	...	115⅛—116½
3,500,000	..	..	4½	4½	Do. 4½ p.c. Red. Deb. ...	110—113	...	111—112
270,466	..	Mar. 6	6	6	Harrogate New Cons. ...	108—113*	−2	...
82,500	..	Mar. 6	7	7	Hastings & St. L. 5 p.c. Conv.	127—137*	−3	...
258,740	..	..	5½	5½	Do. 3½ p.c. Conv.	105—110*	−2	...
70,000	10	Oct. 17	†10	†10	Hongkong & China, Ltd. ...	9½—10½	...	...
213,200	Stk.	Mar. 6	6	6	Hornsey Con. 5½ p.c. ...	115—120*	−3	...
5,600,000	..	Nov. 21	14	10	Imperial Continental Cap.	202—212	−8	199—211½
223,130	..	Feb. 6	3½	3½	Do. 3½ p.c. Red. Deb.	89—94	...	91
235,242	..	Mar. 6	8½	8½	Lea Bridge 5 p.c. Ord. ...	163—168*	−2	...
2,145,907	..	Mar. 6	6	6	Liverpool 5 p.c. Ord. ...	123—125b*	...	...
245,500	..	Dec. 19	5	5	Do. 5 p.c. Red. Pref. ...	105—115b	...	...
306,083	..	Jan. 19	4	4	Do. 4 p.c. Deb. ...	99—101b	...	...
165,736	..	Feb. 20	8	10	Maidstone 5 p.c. Cap. ...	180—200	...	...
56,176	..	Dec. 19	3	3	Do. 3 p.c. Deb. ...	68—73	...	...
75,000	£	Dec 5	†10	†10	Malta & Mediterranean ...	8—9	...	...
392,000		Oct. 1	5½	5½	Metropolitan (of Melbourne) 5½ p.c. Red. Deb.	98—103	...	...
231,978	Stk	Mar. 6	5	5	M. S. Utility "C." Cons. ...	98—103*	−2	99
818,657	..	..	4	4	Do. 4 p.c. Cons. Pref.	92—97*	...	94—95½
112,126	..	Jan. 9	4	4	Do. 4 p.c. Deb. ...	101—103	...	102½—102⅝
148,955	..	..	5	5	Do. 5 p.c. Deb. ...	115—120	...	...
675,000	..	21 May '31	16	16	Montevideo, Ltd.	35—45	...	...
2,061,315	..	Mar. 6	5	5⅔	Newcastle & Gateshead Con.	23/3—24/3d*	−/3	...
682,856	..	..	4	4	Do. 4 p.c. Pref. ...	95½—97½d*	−1½	...
776,706	..	Jan. 9	8½	9½	Do. 8½ p.c. Deb. ...	89—91d	...	...
277,285	..	Nov. 7	5	5	Do. 5 p.c. Deb. '48...	103—107d	...	...
274,000	..	Feb. 20	5	5	Newport (Mon.) 5 p.c. max.	98—100a	...	...
204,940	..	Aug. 22	7½	7½	North Middlesex 6 p.c. Con.	135—145	...	...
396,160	..	Feb. 6	5	5	Northampton 5 p.c. max. ...	98—103	...	...
300,000	..	Dec. 5	7	9	Oriental, Ltd.	112—117	...	...
205,162	..	Dec. 19	8	8	Plym'th & Stonehouse 5 p.c.	140—150	...	...
504,416	..	Feb. 20	8	8	Portsm'th Con. Stk. 4 p.c. Std.	152—162	...	158—162
241,446	..	..	5	5	Do. 5 p.c. max. ...	102—107	...	104
114,000	..	Feb. 20	5	5	Preston 5 p.c. Pref.	108—108	...	...
686,312	..	Jan. 23	4	4	Primitiva 4 p.c. Rd. Db. 1911	82—87	...	...
389,813	..	Dec. 19	4	4	Do. 4 p.c. Cons. Deb.	82—87	...	...
150,000	10	Sept. 19	6	6	San Paulo 6 p.c. Pref. ...	6⅞—7½	...	...
1,736,968	Stk.	Sept. 5	6	6	Sheffield Cons.	116—117e	+1½	...
95,000	..	Jan. 9	4	4	Do. 4 p.c. Deb.	91—95e	...	...
133,201	..	Feb. 20	8½	5	Shrewsbury 8 p.c. Ord. ...	125—130	...	...
90,000	10	June 6	15	15	South African	4—6	...	...
6,709,895	Stk.	Feb. 20	5	7	South Met. Ord.	126—129	+1	127—129
1,135,812	..	..	6	6	Do. 6 p.c. Irred. Pf.	138—143	...	138—140
850,000	..	..	—	20/-g	Do. 4 p.c. Irred. Pf.	101—104	...	102—103
1,895,445	..	Jan. 9	3	3	Do. 3 p.c. Deb. ...	78—83	+1½	81½—83
1 000,000	..	Jan. 23	5	5	Do. 5 p.c. Red. Deb.	110—115	+2	113—114
209,820	..	Mar. 6	8½	8½	South Shields Con.	147½—152½d*	−2½	...
1,543,795	..	Feb. 20	6	6	South Suburban Ord. 5 p.c.	122—127	...	125⅞—126½
300,000	..	..	5	5	Do. 5 p.c. Pref.	112—117	...	116—116½
868,837	..	Dec. 19	5	5	Do. 5 p.c. Deb.	120—125	...	122—124
647,740	..	Feb. 20	5	5	Southampt'n Ord. 5 p.c. max.	103—108	...	108½
121,275	..	Dec. 19	4	4	Do. 4 p.c. Deb.	98—103	...	...
350,000	..	Mar. 6	9/-	5½	Swansea 5½ p.c. Red. Pref.	108—112*	−2	...
200,000	..	Dec. 19	6½	6½	Do. 6½ p.c. Red. Deb.	103—108	...	...
1,076,490	..	Mar 6	6⅔	6⅔	Tottenham and District Ord.	137—142*	−3	...
300,000	..	..	5½	5½	Do. 5½ p.c. Pref. ...	118—123*	−2	...
199,005	..	Dec. 19	4	4	Do. 4 p.c. Deb. ...	98—103	...	...
85,701	..	Sept. 19	6	6	Tuscan, Ltd., 6 p.c. Red. Db.	67—72	...	...
347,769	..	Mar. 6	7	7	Uxbridge, &c., 5 p.ct. ..	130—140*	−3	...
88,330	..	..	5	5	Do. 5 p.c. Pref. ...	108—113*	−2	...
1,322,220	..	Mar. 6	7	7	Wandsworth Consolidated	140—145*	−2	...
1,096,373	..	..	5	5	Do. 5 p.c. Pref.	112—117*	−2	115½—116
1,317,964	..	Dec. 19	5	5	Do. 5 p.c. Deb.	120—125	...	120—122
158,400	..	Mar 6	5	6A	Winchester W.&G 5p.c.Con.	105—110*	−2	...

Quotations at:—a.—Bristol. b.—Liverpool. c.—Nottingham. d.—Newcastle. e.—Sheffield. f.—The quotation is per £1 of stock. g.—For quarter. h.—Paid £3, including 10s. on account of back dividends. * Ex. div. † Paid free of income-tax. ‡ For year.

Potential buyers in the Gas Industry can be reached more surely and economically through the "GAS JOURNAL" than by any other means.

TROTTER, HAINES, & CORBETT LIMITED
BRETTEL'S ESTATE
FIRE-CLAY & BRICK WORKS
STOURBRIDGE

Manufacturers of GAS RETORTS, GLASSHOUSE FURNACE & BLAST FURNACE BRICKS, LUMPS, TILES, and every Description of FIRE BRICKS.

Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

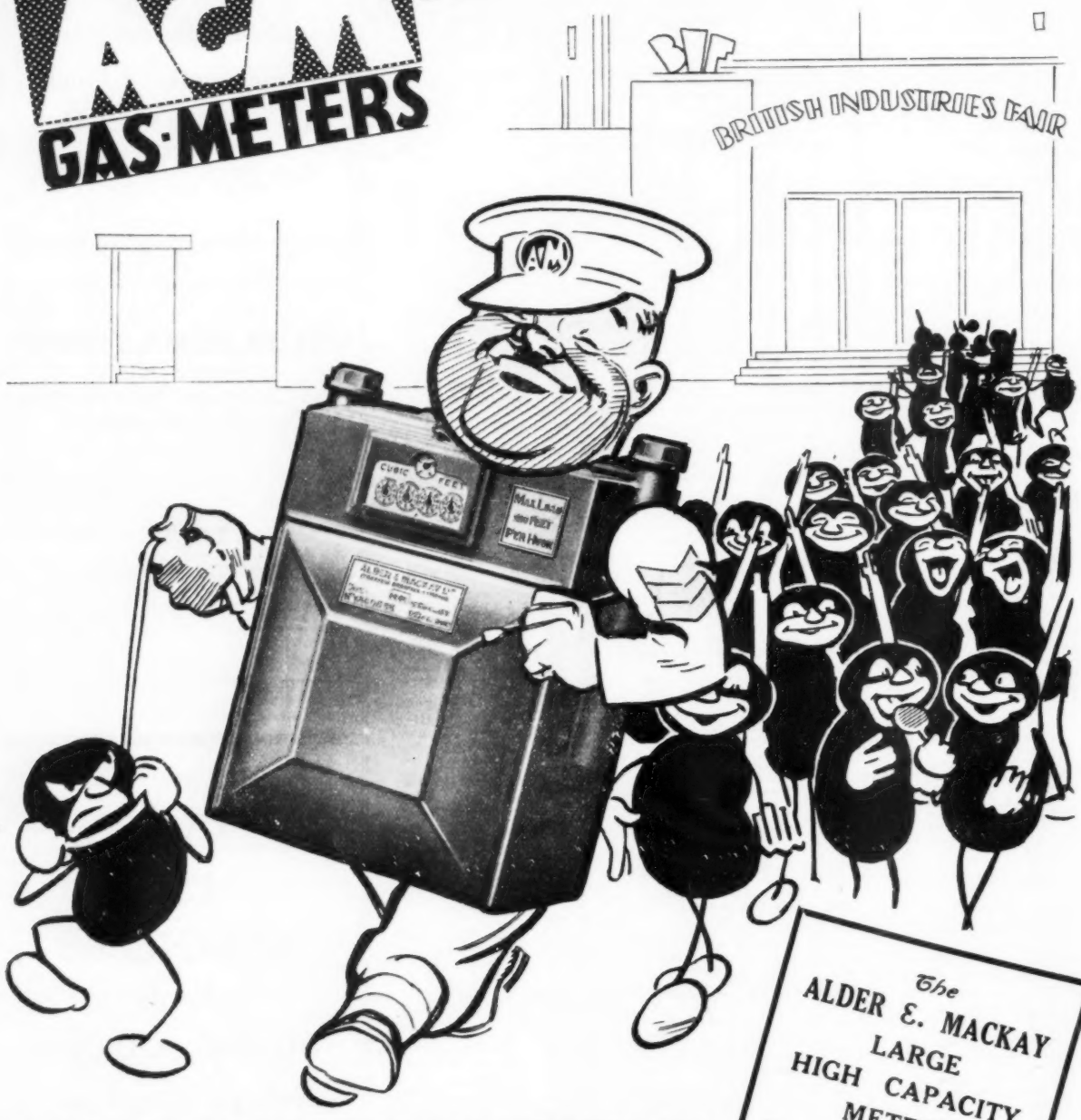
LONDON OFFICE: E. C. BROWN & CO., LEADENHALL CHAMBERS, 4, ST. MARY AXE, E.C.

OVER
150
ENGINEERS
Purify
66,000,000,000
cub. ft. of coal gas
per annum
with
OUR OXIDE

MANCHESTER OXIDE CO. LTD.
MILES PLATTING, MANCHESTER
Telegrams: Oxide, Manchester
Telephone { *2283* } *Collyhurst* / { *2284* } *Manchester*

A&M GAS·METERS

TRAIN·THE·THERMS



THE·PARADE·OF·THE·THERMS

"March Easy!" After fourteen days' "High Capacity" at 'Castle Bromwich' the squad deserves a little latitude. Everybody is happy except that little fellow who has not learned his lesson yet. There is no escaping when Sergt. A. E. M. Meters is in control.

ALDER & MACKAY
LIMITED

MAKE METERS OF METICULOUS MEASUREMENT

The
ALDER E. MACKAY
LARGE
HIGH CAPACITY
METERS

These meters are soundly constructed for long and exacting service. The 100 c.ft. size has been entirely re-designed; its capacity per rev. is ·25 c. ft. and its speed is 400 revs. per hour. Loss of pressure at capacity is unusually small and registration is precise over a very large range. Particulars of A. E. M. Large and Small High Capacity Meters will gladly be sent on request.

ALDER E MACKAY LTD., EDINBURGH, LONDON E BRANCHES.

Property of
Seattle Public Library

THE BENEFITS OF THE "DRI-GAS" PROCESS FROM THE SALES POINT OF VIEW . . .

As it is not possible to estimate precisely the revenue earning capacity of a Dri-Gas Plant before installation, the experience of Engineers who have distributed dehydrated gas over an extended period is of value. Mr. T. R. Cook, Engineer and Manager of the Blackpool Gas Department, in addressing the Lancashire District Salesman Circle says:

"The best gas service must be based on the delivery of gas of a constant calorific value, specific gravity, and adequate pressure at all times of the day or night.

The Dri-Gas Process is giving excellent results in the prevention of waterlogged services, and also in eliminating the troubles experienced from rust-choked services. There are few instances to-day where lead piping is used solely for gas services, but Blackpool adopted this material many years ago, and with the Dri-Gas Process it is astonishing how few complaints have been received.

During the past three years, since the plant has been in operation, we have only had, on an average, 46 service complaints of every kind per annum out of some 31,000 services, and more than half were due to rust in wrought-iron pipes laid some 30 years ago. There have been no renewals required of lead services The services, I might say, are laid in wood troughing and it can be quite understood that with lead there are no troubles with rust."

(*From the "Gas Salesman," January issue*)

Plants now Building

PLYMOUTH
BRIGHTON
TONBRIDGE
NOTTINGHAM
MARGATE
METROPOLITAN GAS CO.
(Melbourne, Australia)

We shall be pleased to furnish further evidence of the benefits of Gas Drying supplied by Engineers and Undertakings to whom some of our 80 installations have been supplied.

HOLMES
FOUNDED 1850
HUDDERSFIELD

IN THE ABOVE CASE ONLY ONE SERVICE COMPLAINT WAS REGISTERED FOR EACH 28 MILLION CUBIC FEET OF GAS DISTRIBUTED

W. C. HOLMES & CO. LTD., HUDDERSFIELD

Telephone: Huddersfield 1573 (Private Branch Exchange).
London Office: 119 Victoria Street, Westminster, S.W.1. *Telephone:* Victoria 4505. *Telegrams:* Holmes, Huddersfield *Telegrams:* Ignitor, Sowest, London

C92

INDEX TO "JOURNAL" ADVERTISERS.

	PAGE
Alder & Mackay, Ltd.	704
Allan, Thomas, & Sons, Ltd.	—
Anglo-American Oil Company, Ltd.	706
Arden Hill & Co.	657
Asbestos Cement Building Products, Ltd.	—
Ashmore, Benson, Pease, & Co., Ltd.	656
Assessment of Gas Undertakings	—
Astrah Products, Ltd.	651
Automatic Light Controlling Co., Ltd.	—
Avery, W. & T., Ltd.	—
Baldwins, Ltd.	—
Bale & Church, Ltd.	705
Barclay, Andrew, Sons, & Co., Ltd.	658
Barrowfield Ironworks, Ltd.	658
Bates, J., & Sons	658
Blakeley Firth, Sons, & Co., Ltd.	706
Braddock, J. & J. Wrapper II.,	705
Bray, George, & Co., Ltd.	—
British Aluminium Co., Ltd.	—
British Foreign and Colonial Automatic Light Controlling Co., Ltd.	—
British Furnaces, Ltd.	—
British Gas Purifying Materials Co.	705
British Steam Specialties, Ltd.	—
British Thomson-Houston Co., Ltd.	—
Broadbent, Thos., & Son, Ltd.	—
Broadhead Constructions, Ltd. Wrapper I.	
Bugden, T., & Co.	661
Cambridge Instrument Co., Ltd.	—
Cannon Iron Foundries, Ltd.	—
Carron Company	—
Cellactite & British Uralite, Ltd.	—
Chemical Engineering and Wilton's Patent Furnace Co., Ltd. Wrapper I.	
Clapham Bros., Ltd.	710
Clayton, Son, & Co., Ltd.	—
Cookers & Geysers, Ltd.	—
Cort, Robert, & Son, Ltd.	—
Cowan, W. & B. Wrapper III.	
Crone & Taylor, Ltd.	—
Cutler, Samuel, & Sons, Ltd.	—
Davis Gas Stove Co., Ltd.	—
Davison & Partner, Ltd.	—
Dempster, R. & J., Ltd. Centre VIII.	
Dempster, R., & Sons, Ltd. Centre II.,	706
Denison, Saml., & Son, Ltd.	663
Diaphragm & General Leather Co., Ltd.	—
Donkin Co., Ltd. (The Bryan) Wrapper II.	
Dougall's Gas Meters, Ltd.	—
Dry Gasholders, Ltd.	662
Duxbury, Thomas, & Co. Wrapper I.	
E. B. Refractory Cement Co., Ltd.	—
Economic Gas Boiler Co., Ltd.	—
Electrolux, Ltd.	661
Evans, Joseph, & Son (Wolverhampton), Ltd. Wrapper IV.	
Expanded Metal Company, Ltd.	—
F. C. Construction Co., Ltd.	—
Falk, Stadelmann, & Co., Ltd.	663
Fletcher, Russell, & Co., Ltd.	—
Foster & Pullen, Ltd.	—
Fraser & Chalmers Engineering Works	—
Gas Chambers and Coke Ovens, Ltd.	—
Gas Meter Co., Ltd. Wrapper IV.	
Gas Purification and Chemical Co. Wrapper I.,	705
General Gas Appliances, Ltd.	667
Gibbons Bros., Ltd.	—
Glenboig Union Fireclay Co., Ltd. Wrapper II.	
Glover, George, & Co., Ltd. Wrapper I.	
Glover, Thos., & Co., Ltd. Wrapper I,	668
Goodall, Clayton, & Co., Ltd.	—
Grant, David, & Co.	—
Graphite Products, Ltd.	—
Green & Boulding, Ltd.	—
Griffiths Bros. & Co. (London), Ltd. Wrapper I.	
Hanley, A.	706
Harper, John, & Co., Ltd.	653
Harris & Pearson, Ltd.	706
Head, Wrightson, & Co., Ltd.	—
Holmes, W. C., & Co., Ltd.	707
Horstmann Gear Company, Ltd.	—
Humphreys & Glasgow, Ltd.	666
Huntington Heberlein & Co., Ltd.	651
Hurry Water Heater Co.	—
Hutchinson Bros., Ltd.	705
Institute of Chemistry	—
Jenkins, W. J., & Co., Ltd.	—
Keith, James, & Blackman Company, Ltd.	710
Kempton, C. H., & Co., Ltd.	—
King, Walter, Ltd.	703
King's Patent Agency	705
Kirkham, Hulett, & Chandler, Ltd.	—
Kleenoff Co.	705
Laidlaw, R., & Son (Edin.), Ltd.	—
Lead Wool Company, Ltd.	658
Le Bas Tube Co., Ltd.	—
Leroy, F., & Co. Ltd.	660
Lighting Trades Ltd.	—
London Electric Firm, The Wrapper II.	
Macpherson, Donald, & Co., Ltd.	—
Main, R. & A., Ltd. Centre VII.	
Manchester Oxide Co., Ltd.	703
Martineau & Smith	—
McKelvie, James, & Co. Wrapper I.	
Mewburn, Ellis, & Co.	705
Mining & Industrial Equipment, Ltd.	—
Mitchell, H., & Co. Wrapper I.	
Morris Commercial Cars Ltd.	—
National Benzole Co., Ltd.	—
National Enamels, Ltd.	—
Newton Chambers & Co., Ltd.	—
Nobel Chemical Finishes, Ltd.	—
Nortons (Tividale), Ltd.	—
Orme, George, & Co.	664
Oughtibridge Silica Firebrick Co.	—
Parkinson Stove Co., Ltd. Centre III	
Parkinson, W., & Co. Wrapper I.,	668
Pass, E., & Co.	658
Patent Retorts, Ltd.	649
Peckett & Sons, Ltd.	649
Peebles & Co., Ltd.	656
Piggott, Thos., & Co., Ltd.	—
Potterton, T. (Heating Engineers), Ltd.	—
Pulsometer Engineering Co., Ltd.	—
Purimachos Ltd.	—
Radiation Ltd. Centre IV., V.,	657, 665
Reavell & Co., Ltd.	709
Richmonds Gas Stove Co., Ltd.	—
Robinson, J. H., & Co. (L'pool), Ltd.	660
Ross, Chas., Ltd.	705
Rotary Meter Company, Ltd.	652
Rotherham & Sons, Ltd.	661
Ruscoe, John, & Co., Ltd.	—
Sawer & Purves	—
Scottish Tube Co., Ltd.	—
Sheepbridge Coal and Iron Co., Ltd.	—
Siebe, Gorman, & Co., Ltd.	—
Simon-Carves, Ltd.	649
Sisson, W., & Co., Ltd.	—
Smith Meters, Ltd. Centre VI.	
Solent Engineering Co., Ltd.	—
South Metropolitan Gas Company	—
Southerton, Jas., & Son	—
Spencer-Bonecourt, Ltd.	664
Sperryn & Co.	—
Stanton Ironworks Co., Ltd.	701
Staveley Coal and Iron Co., Ltd.	—
Stein, J. G., & Co., Ltd.	—
Stewarts and Lloyds, Ltd.	—
Strachan & Henshaw, Ltd.	706
Stringer Bros.	—
Sugg, Wm., & Co., Ltd.	—
Sutherland, A. G., Ltd.	—
Thompson, J. (Wolverhampton), Ltd.	—
Tilley Bros., Ltd.	654
Torbay Paint Company, Ltd.	—
Trier Bros., Ltd. Wrapper IV	
Trotter, Haines, and Corbett, Ltd.	703
Tully Sons & Co., Ltd.	—
Turbine Furnace Co., Ltd.	—
Turner, F. (Art Metal), Ltd.	—
Valor Co., Ltd.	661
Vertical Gas Retort Synd., Ltd. Wrapper I.	
Vulcan Stove Co., Ltd.	654
Wakelin, F. H., Ltd.	—
Walker, C. & W., Ltd.	652
Walker, Crosweller, & Co., Ltd.	659
Waller, Geo., & Son, Ltd.	650
Waterless Gasholder Co., Ltd.	—
Wellington Tube Works, Ltd. Wrapper IV.	
Welsbach Light Company, Ltd.	—
West's Gas Improvement Co. Centre X.	
Westwood & Wrights, Ltd.	—
Whessoe Foundry and Eng. Co., Ltd.	655
Willey & Co., Ltd. Centre VIII.	
Williamson Cliff, Ltd.	—
Wilson (George) Gas Meters, Ltd.	705
Wilsons & Mathiesons, Ltd.	665
Withinshaw, A.	—
Woodall-Duckham Co., Ltd. Centre I.	
Wright, Alex., & Co., Ltd. Centre IX.	
Wright, John, & Co.	—

	PAGE
Appointments Vacant and Wanted	705
Bye-Products Wanted	—
Company Notices	706
Contracts Open	705
Notice	—
Patents	705
Plant, &c., for Sale and Wanted	706
Premium Pupil	—
Publications	—
Stock Issue	—